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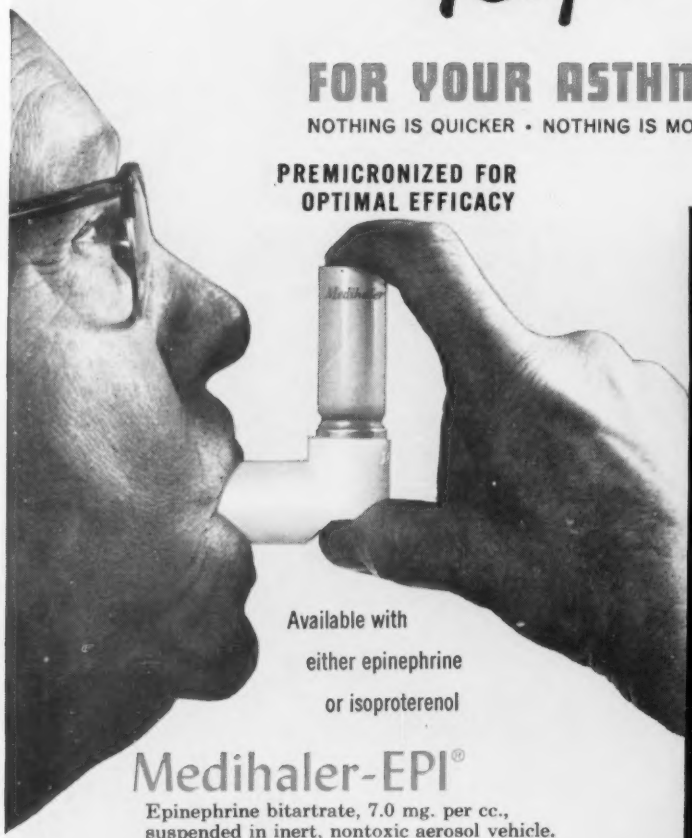

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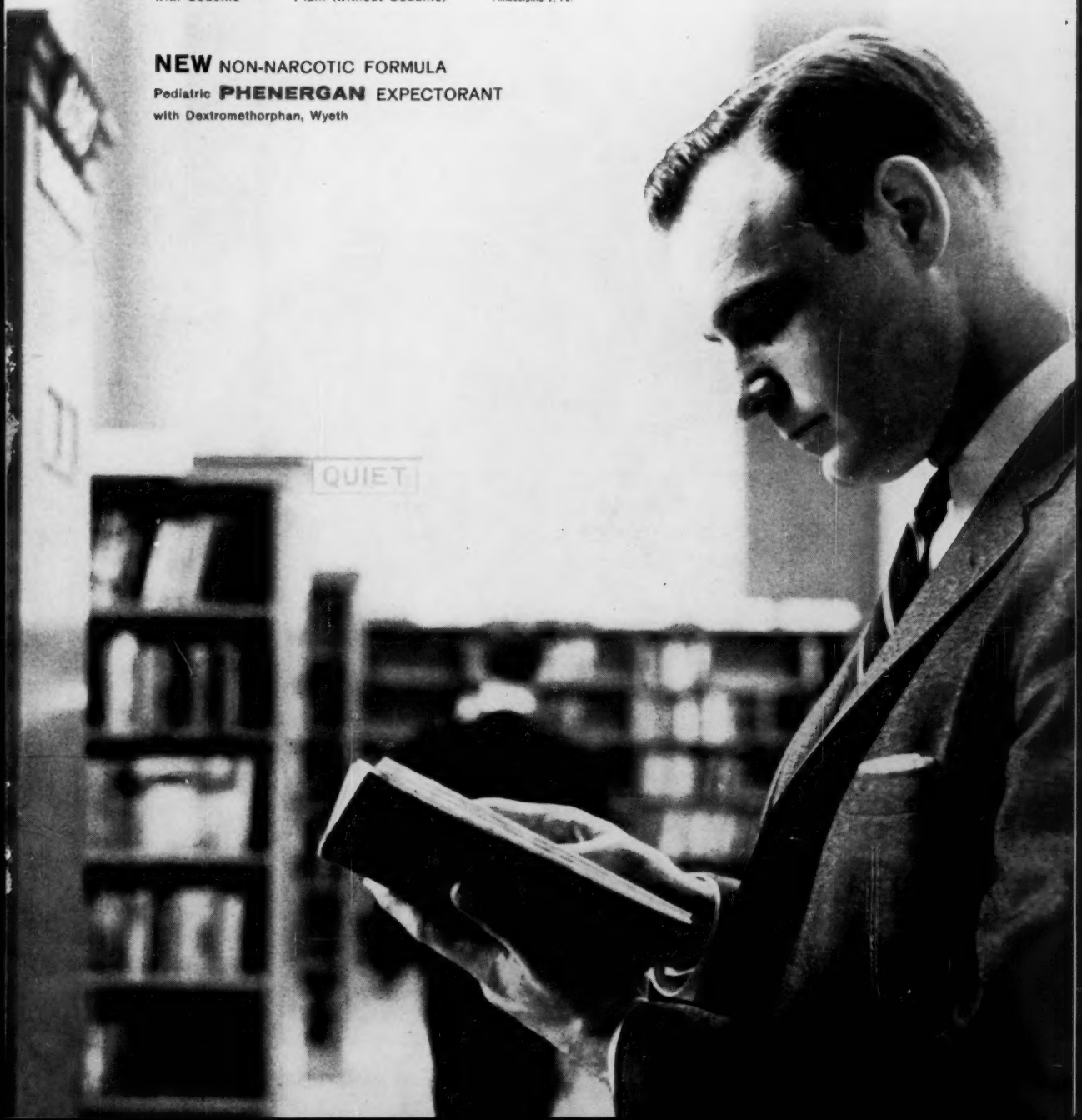

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Indications: Any condition involving skeletal muscle spasm, as **musculoskeletal disorders:** acute and chronic back ache, arthritides, bursitis, disc syndrome, fibrositis, myalgia, myositis, osteoarthritis, following orthopedic procedures, rheumatoid arthritis.

*Davis, O. F.; Levine, A. J.; Beck, C., and Horwitz, B.: Clin. Med. 6:1595-1599 (Sept.) 1959.

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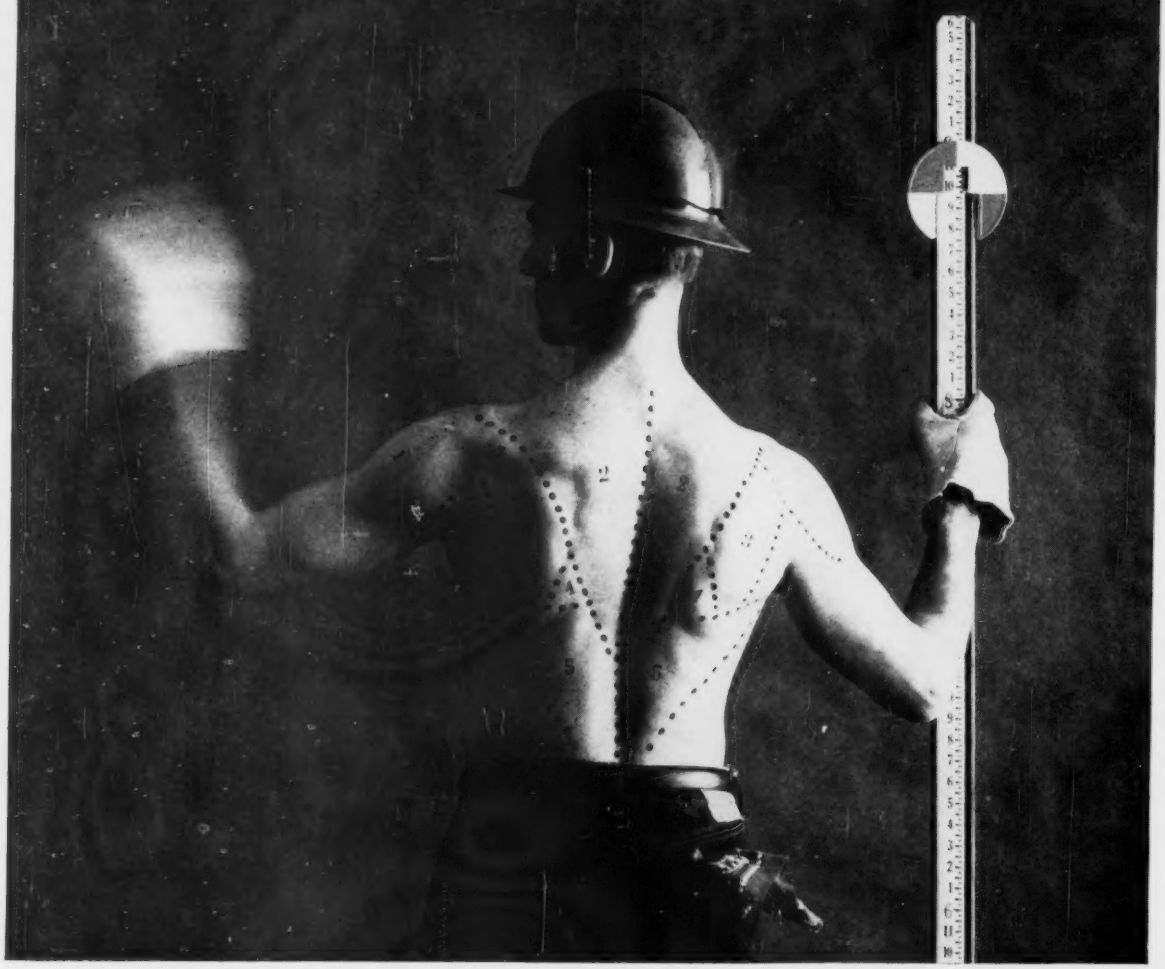

INDUSTRIAL MEDICINE and SURGERY

ESTABLISHED 1932

The International Journal of Medicine in Industry

JANUARY, 1960
VOLUME XXIX
NUMBER 1

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BPA

PERSONAL NEWS AND NOTES

American Academy of Occupational Medicine will meet February 10-12, 1960, at Williamsburg Inn, Williamsburg, Virginia.

JOSEPH K. NEWTON, M.D., has assumed duties as resident doctor for Colorado Fuel & Iron Corporation at the Valdez and Allen mines. In recent years DR. NEWTON has resided in Kentucky and Tennessee and has been with the Veterans Administration as a specialist in tuberculosis, diseases of the chest and bronchoscopy.

CHARLES L. RAVARIS, M.D., has been appointed Assistant Medical Director of E. R. Squibb & Sons it is announced by L. B. HOBSON, M.D., Medical Director.

A native New Englander, DR. RAVARIS received his A.B. degree from Boston University in 1949. He is a veteran of World War II, having served with the U. S. Navy in the Asiatic-Pacific Theater. From 1950 to 1954 he was Defense Research Board Scholar at McGill University and from 1952 to 1954, Demonstrator in Physiology. He received the Ph.D. degree from McGill in 1954. Dr. Ravaris's M.D. degree was obtained in 1958 from the University of British Columbia, where he also served as Demonstrator in Physiology. From 1958 to 1959 he was a rotating intern at the Henry Ford Hospital in Detroit.

JAMES L. SALOMON, M.D., was recently appointed Medical Director, Wichita Division, Boeing Airplane Company, Wichita, Kansas. Prior to his association with Boeing as a Staff Physician in June of this year, he was Medical Director of the Aircraft Engine Division, Ford Motor Company, Chicago, Illinois. His industrial medical affiliations have also included work in industrial clinics in Chicago, Illinois and Detroit, Michigan, and the Highland Park Plant, Ford Motor Company, Highland Park, Michigan.

DR. SALOMON took his undergraduate work as a Rector Scholar at DePauw University, Greencastle, Indiana, receiving his A.B. degree in 1941. He received his M.D. degree from Northwestern Medical School in 1945, and returned, after service in the U. S. Navy to be a Clinical Associate in the Department of Surgery, teaching Surgery and Surgical Anatomy, and doing surgical research while completing surgical residencies at St. Luke's Hospital and Hines V.A. Hospital.

DR. SALOMON is a Fellow in the Industrial Medical Association, and has been on various committees of the Association and its Industrial Health Conferences. He has been on the Board of Governors and held other positions in his component Society, the Central States Society. He was Chairman of the Industrial Medicine Committee of the Chicago Heart Association, as well as active in the Chicago Association of Commerce and Industry. DR. SALOMON also is a member of the Medical Directors Club of Chicago.

A. WALTER HOOVER, M.D., has been appointed Assistant Medical Director of the Pennsylvania Railroad at Philadelphia. DR. HOOVER succeeds ROBERT S. AYERLE, M.D., who has resigned.

In his new post DR. HOOVER will work with the railroad's Medical Director, A. M. HURSH, M.D., in over-all direction of the Pennsylvania's extensive employee medical program. The railroad has 47 full-time doctors assigned to the program for its 80,000 employees.

★ AMERICAN ASSOCIATION OF RAILWAY SURGEONS ★

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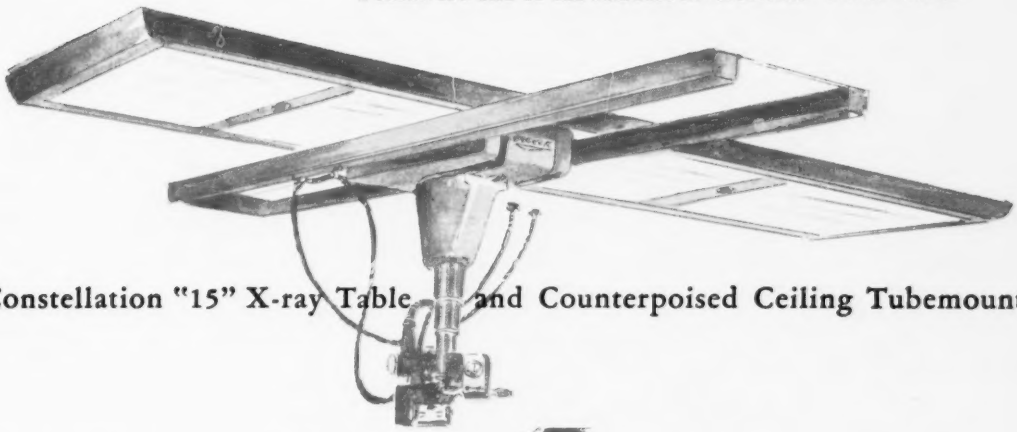
Last but not least—*it's a whale of a lot for the money.* Believe me . . . I shopped around plenty before making the plunge. I think it's one of the solidest investments* I ever made.



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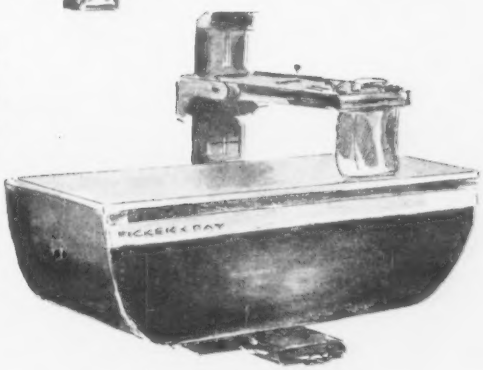

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The Association of Industrial Medical Officers (Great Britain) held its Annual General Meeting October 30, 1959, and elected the following officers:
President: DR. T. S. SCOTT, M.D., Clayton Aniline Company Limited, Clayton, Manchester 11.
Immediate Past President: DR. W. E. CHIESMAN, C.B., F.R.C.P., The Treasury, Whitehall, London, S.W. 1.
Honorary Secretary: DR. R. A. GORDON SMITH, M.D., Albert E. Reed & Co. Ltd., Larkfield, Maidstone, Kent.
Honorary Treasurer: DR. P. A. B. RAFFLE, M.D., London Transport Executive, Griffith House, 280 Marylebone Road, London, N.W. 1.
Honorary Editor: DR. F. H. TYRER, West Midlands Gas Board, Edmund Street, Birmingham 3.

Institute of Industrial Health, University of Cincinnati, is offering graduate fellowships in industrial medicine. The Institute provides professional training for graduates of approved medical schools who have completed at least one year of internship.

The three-year program leading to the degree of Doctor of Industrial Medicine satisfies the requirements for certification in Occupational Medicine by the American Board of Preventive Medicine. Two years are devoted to intensive academic and clinical study in the field of industrial medicine. A third year is spent in residency in an industrial medical department or in some comparable organization.

Two other programs of study are offered to qualified applicants. A one-year course is available to applicants who wish to become candidates for the degree of Master of Science. In addition, a three-year academic program, leading to the degree of Doctor of Science, is available to those applicants who wish to pursue careers in teaching and research. A number of fellowships stipends is available to candidates in these programs also.

For additional information, write: Secretary, Institute of Industrial Health, College of Medicine, Eden and Bethesda Avenues, Cincinnati 19, Ohio.

C. CRAIG WRIGHT, M.D., has joined the Reynolds Metals Company at Florence, Ala., as plant physician based at the aluminum firm's two-plant Listerhill operations.

He succeeds J. H. HAGAN, M.D., who is leaving to private practice in Georgia.

DR. WRIGHT has had intensive special training in preventive and industrial medicine in a three-year residency at Ohio State University where he was awarded B.A. and M.D. degrees in 1953.

As part of his residency at Ohio State, DR. WRIGHT was assigned to the Pan American World Airways industrial medicine program. In that program he traveled widely, visiting the globe-circling airline's foreign bases on medical matters.

In the three years between his Ohio State graduation and his return there for the special industrial medicine residency, DR. WRIGHT served in the Air Force with one year as an intern at New York's Bellevue Hospital and two years at Shaw Air Force Base in South Carolina as base flight surgeon and commander of the 363rd Airborne Tactical Hospital.

DR. WRIGHT's responsibilities include health and medical matters within the plants as well as the usual clinical duties of an industrial physician. His special training in industrial medicine will make his work of special value to the approximately 4,000 people employed in the two big Reynolds Listerhill plants.

ROBERT S. GRAHAM, M.D., has been appointed Assistant Medical Director with the Equitable Life Assurance Society of the United States.

DR. GRAHAM, a graduate of Temple University's School of Medicine, will serve in the bureau of insurance medicine of the company's medical department.

WILLIAM P. SHEPARD, M.D., former Chief, Health and Welfare Division, Metropolitan Life Insurance Company; has been named Chief Medical Director of that Company. DR. SHEPARD received his M.D. degree from the University of Minnesota.

The British Occupational Hygiene Society presents a Symposium on Inhaled Particles and Vapours, at Oxford, England, on March 29 to April 1, 1960. The subjects of the Symposium have a bearing on many hygiene problems including silicosis, asbestosis and the other pneumoconioses, and on the damage to health produced by smog, tobacco smoke, radioactive gases and dusts, airborne bacteria and toxic vapours. The Society believes that the Symposium will meet a real need in providing an opportunity for the comprehensive discussion of recent research in this field and that the published proceedings will be of value not only to research workers, but also to those concerned with the practical problems of establishing and maintaining safe environments.

The main language of the Symposium will be English, but papers may be accepted in French or German. It is hoped to provide interpretation in English, French and German during the discussions. As the numbers attending must be limited to 250 those who wish to attend are advised to notify their intention as soon as possible. Further details with the final programme and registration form will be sent to those who express their wish to receive them by sending a card as soon as possible to: Dr. J. S. McLintock, Medical Service, National Coal Board, Hobart House, London, S.W.1.

RAYMOND G. CORNELL, M.D., has been named to the top medical post at the U. S. Steel's Geneva Works, near Provo, Utah. DR. CORNELL attended Washington and Jefferson College, where he received a degree in biology and chemistry. He completed medical studies at Temple University. He was a captain in the Air Force.

Institute of Industrial Health, University of Cincinnati, is offering graduate training for professional personnel other than physicians, in the field of environmental hygiene (industrial hygiene, air pollution, industrial wastes, industrial toxicology, etc.). The professional training is provided for graduates of ap-

report of a study in which a long acting antihistamine-decongestant combination* (RYNATAN®) *was used in the treatment of a variety of respiratory infections in industrial workers*

"Our efforts in an industrial practice have been aimed not only at keeping the man on the job but, by effective relief of symptoms, increasing his productive effort and sense of well-being while at work."*

"This study relates to a long acting antihistamine-decongestant combination in the treatment of a variety of respiratory infections by providing relief of symptoms for 90% of 175 cases with a low frequency of side effects." Furthermore, ". . . we felt the objective improvement was such that this antihistamine-decongestant shortened the duration of illness from respiratory infection and provided relief of symptoms due to rhinorrhea, sneezing, postnasal drip, headache and generalized congestion."*

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Excellent	50	28.6%	89.7% benefited
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*Steller, R. E.; DeMar, E. A., and Schwartz, F. R.: Symptomatic Treatment for Upper Respiratory Infections, Industrial Medicine and Surgery 28:362 (August) 1959.

Rynatan is the trade name of Irwin, Neisler & Co., Decatur, Illinois, for the antihistamine combination of phenylephrine tannate, prophenpyridamine tannate and pyrilamine tannate.

proved schools of engineering or science.

A three-year course of instruction leading to the degree of Doctor of Science in Industrial Health, devotes two years to intensive academic study, and a third to the preparation of a thesis (additional practical work may be required as indicated).

A one-year course is also offered to qualified applicants who may be candidates for the Master of Science degree.

A limited number of fellowship stipends is available to qualified candidates. For additional information, write: Secretary, Institute of Industrial Health, College of Medicine, Eden and Bethesda Avenues, Cincinnati 19, Ohio.

MARK R. LEADBETTER, M.D., head of the medical department of the Cherokee Plant of Merck & Co., Inc., has been appointed chairman of the Commission on Industrial Health of the Medical Society of Pennsylvania. DR. LEADBETTER will assist the commission in drawing up recommendations for improving the health of industrial workers.

13th International Congress on Occupational Health
New York City, July 25-July 29, 1960

Congress on Occupational Health is held every three years under the auspices of the Permanent Committee and International Association on Occupational Health. A committee in the country where the meeting is held takes responsibility for organizing the Congress. In the United States in 1960, the Organizing Committee is headed by LEO WADE, M.D., 15 West 51st Street, New York City.

The scientific program is as follows: Monday—Plenary Session, Influence of Environmental Factors, Medical Practices, Social and Legal Aspects, Environmental Hygiene, *Work Physiology and Psychology.

Tuesday — Environmental Hygiene, Medical Practices, Social and Legal Aspects. Influence of Environmental Factors, *Administrative Practices, Specific Industries, Surgical Practices, Influence of Environmental Factors, Work Physiology and Psychology, *Education and Training.

Wednesday — Environmental Hygiene, Medical Practices, Administrative Practices. *Influence of Environmental Factors (Pneumoconiosis), Field Trip.

Thursday — Specific Industries, Work Physiology and Psychology, Administrative Practices, Influence of Environmental Factors, *Medical Practices, Environmental Hygiene, Surgical Practices, Education and Training, Work Physiology and Psychology, *Influence of Environmental Factors (Radiation).

*Major Sessions — simultaneous translation available.

Friday — General, Environmental Hygiene, Medical Practices, Influence of Environmental Factors, *Social and Legal Aspects. Plenary Session.

Persons desiring to present a paper should contact the Program Chairman, IRVING R. TABERSHAW, M.D., 375 Park Avenue, New York City, U. S. A.

Commercial exhibits of products of interest to physicians in occupational health practice are being arranged.

Scientific exhibits of general interest will also be shown. Persons desiring to present a scientific exhibit should contact the Program Chairman, Dr. Irving R. Tabershaw, as soon as possible.

The American Express Company has been designated as the official travel agency of the Congress. Prospective members of the Congress will find this company helpful in arranging details and answering questions about travel.

Tours to various points of interest will be arranged under the charge of the American Express Company. These tours will include toxicology research laboratories, industrial plants of various kinds, governmental health and industrial hygiene institutions, educational centers for industrial health. American Express will provide details about these tours.

Several events are being planned for general participation of members of the Congress. General entertainment events and trips for the ladies will also be available. Details of ladies' events may be obtained later from the local American Express agent.

The Waldorf-Astoria Hotel has been selected as the headquarters and all meetings and functions will be held there. Rooms for registrants at the meeting are being held at the following hotels. For other housing facilities local American Express agents should be consulted.

	Rates Per Day Single	Two Persons Double and Twin Beds	Suite
Waldorf-Astoria*	$10-$15	16-21	35-50
Belmont Plaza	9.85	13.85	—
Lexington	9.65	14.90	—
Shelton Towers	9.18	14.22	—
Beverly	—	—	28.32

*Headquarters Hotel

Room reservations should be made as early as possible. Please indicate the expected date of arrival and expected date of departure from the hotel of your choice. When possible, it will be found most convenient to be housed in the headquarters hotel. Foreign members attending the conference may wish to share a room with a friend to reduce expenses. If this is desired, please make these personal arrangements in advance and indicate the person sharing the room on the reservation form. *If a room reserved in advance is not used on the first day, it can be made available for others.*

Apply for room reservations to R. E. ECKARDT, M.D., Secretary General, P. O. Box 45, Linden, New Jersey, U. S. A., by May 1, 1960.

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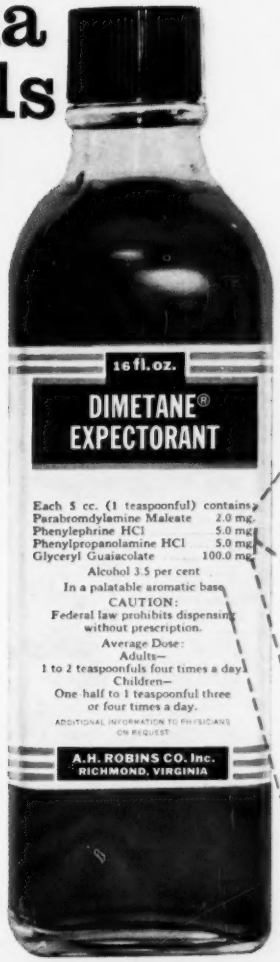

the antihistamine most likely to succeed

two highly approved decongestants

the expectorant that works best— increases respiratory tract fluid almost 200%

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with added dihydrocodeinone 1.8 mg./5 cc. when additional cough suppressant action is needed

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HOW SUPPLIED:
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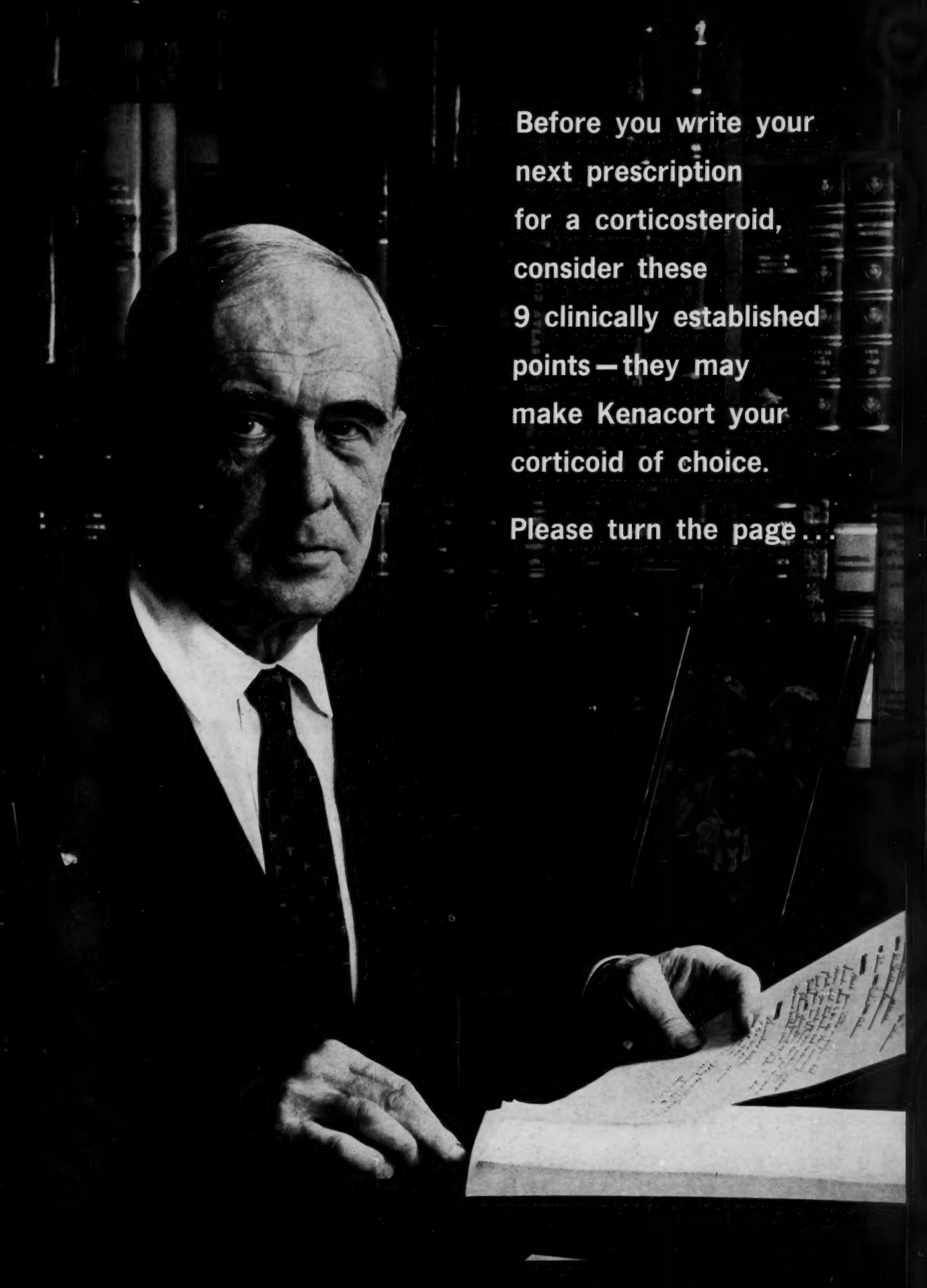
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pre-prescription
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initial therapy—remarkably free from complications

Allison, J. R., Sr., and Allison, J. R., Jr.:
Monographs on Therapy 3:99 (Oct.) 1958.

pre-prescription
point number **2**

continuing therapy —maintenance doses are low

Feinberg, S. M.; Feinberg, A. R., and Fisherman, E. W.:
J. A. M. A. 167:58 (May 3) 1958.

pre-prescription
point number **3**

no sodium or water retention—low salt diet not necessary

Hartung, E. F.:
J. A. M. A. 167:973 (June 21) 1958.

pre-prescription
point number **4**

absence of edema

Council on Drugs:
J. A. M. A. 169:257 (Jan. 17) 1959.

pre-prescription
point number **5**

less likely to create electrolyte disturbance

Bongiovanni, A. M.; Mellman, W. J., and Eberlein, W. R.:
J. Pediat. 53:3 (July) 1958.

pre-prescription
point number **6**

no secondary hypertension—no significant change in pulse, respiration, or blood pressure

Shelley, W. B.; Harun, J. S., and Pillsbury, D. M.:
J. A. M. A. 167:959 (June 21) 1958.
Bernsten, C. A., Jr., and others:
New York Rheumatism Association, Annual Meeting,
New York, April 9, 1959.

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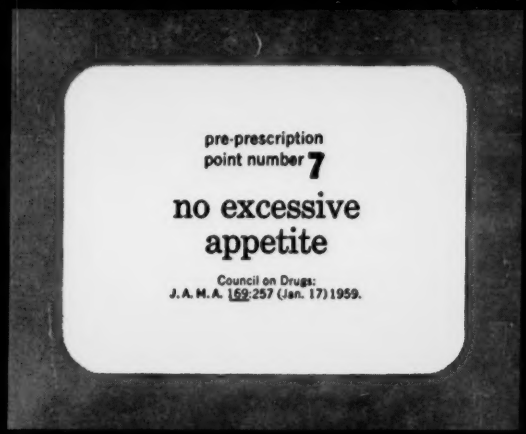

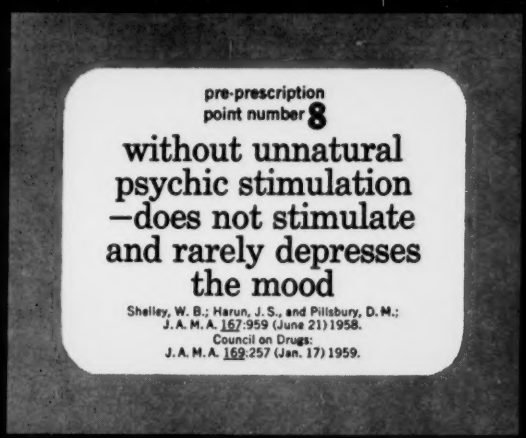
pre-prescription
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without unnatural
psychic stimulation
—does not stimulate
and rarely depresses
the mood
Shelley, W. B.; Harun, J. S., and Pillsbury, D. M.;
J. A. M. A. 167:959 (June 21) 1958.
Council on Drugs:
J. A. M. A. 169:257 (Jan. 17) 1959.

SQUIBB Squibb Quality — the Priceless Ingredient

KENACORT® A SQUIBB TRADEMARK

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continuing therapy —maintenance doses are low

Feinberg, S. M.; Feinberg, A. R., and Fisherman, E. W.:
J. A. M. A. 167:58 (May 3) 1958.

pre-prescription
point number **5**

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pre-prescription
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no sodium or water retention—low salt diet not necessary

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New York Rheumatism Association, Annual Meeting,
New York, April 9, 1959.

pre-prescription
point number **8**

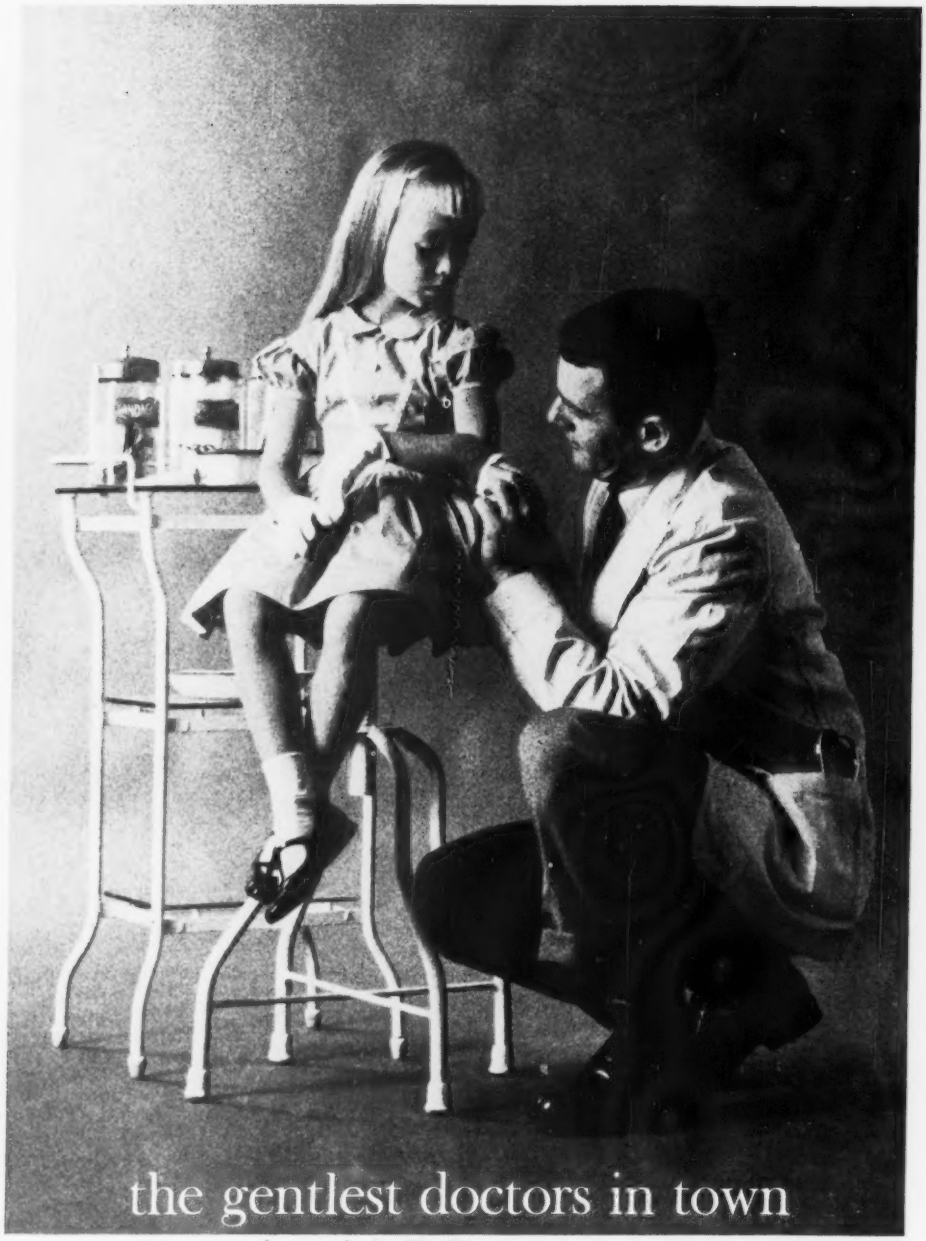
without unnatural psychic stimulation —does not stimulate and rarely depresses the mood

Shelley, W. B.; Harun, J. S., and Pillsbury, D. M.:
J. A. M. A. 167:959 (June 21) 1958.
Council on Drugs:
J. A. M. A. 169:257 (Jan. 17) 1959.

pre-prescription
point number **9**

gastrointestinal complaints infrequent

Hartung, E. F.:
J. A. M. A. 167:973 (June 21) 1958.



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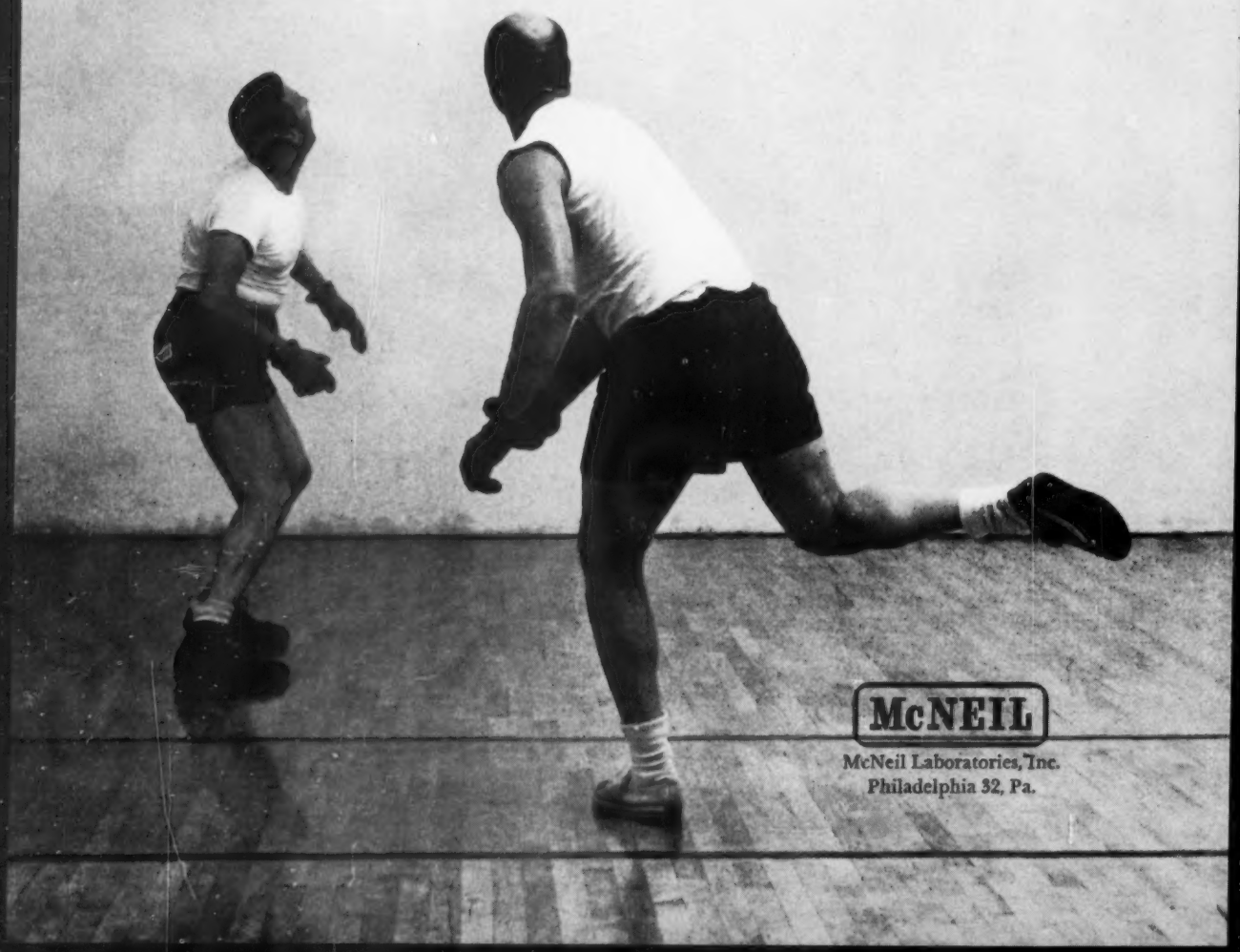

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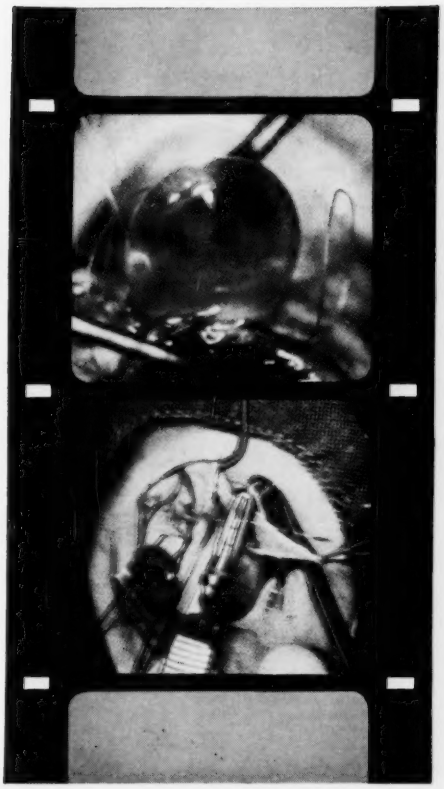

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1. Kuba, E. F.: First Stage Treatment of Burns and Prevention of Shock, Indust. Med. 12:369-371 (Aug.) 1958.

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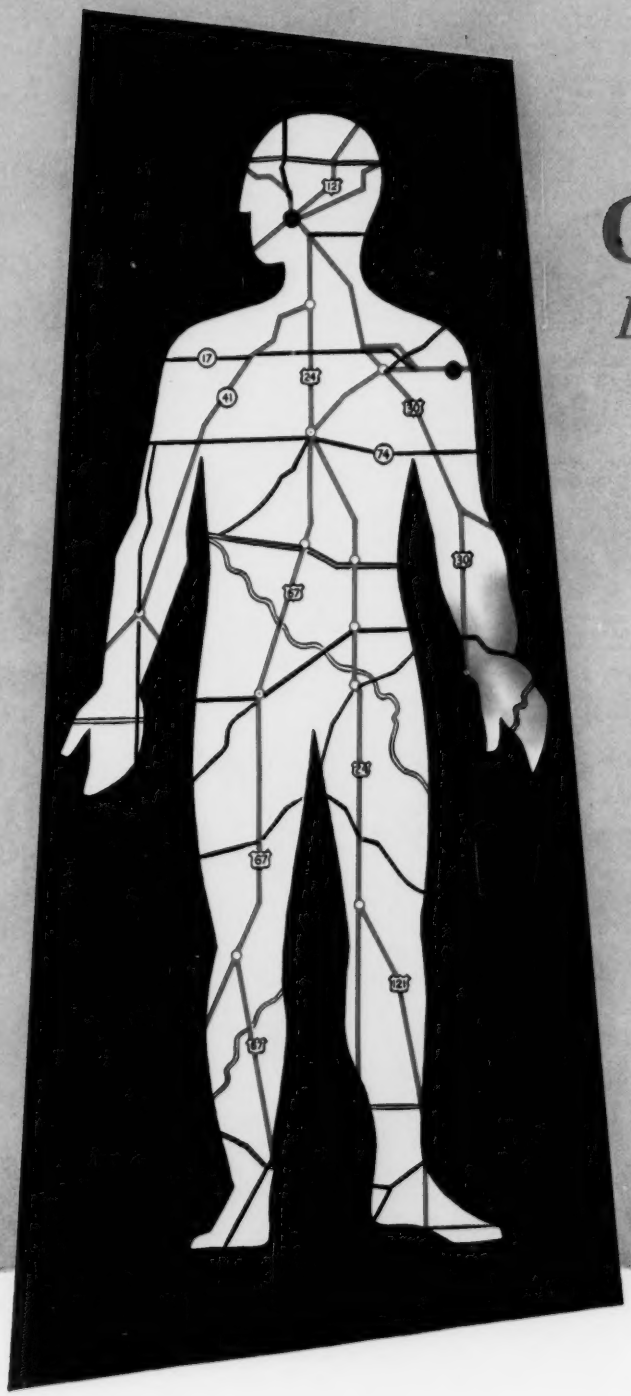

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OF DERMATOMYCOSES

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PENETRATES THE KERATIN BARRIER

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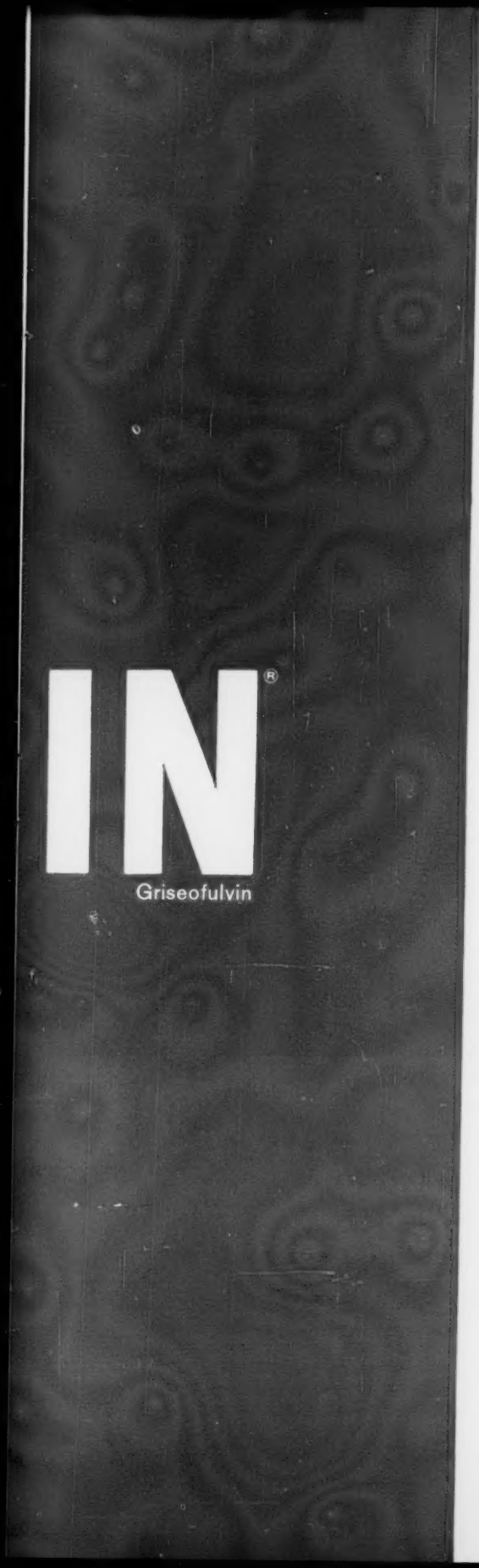

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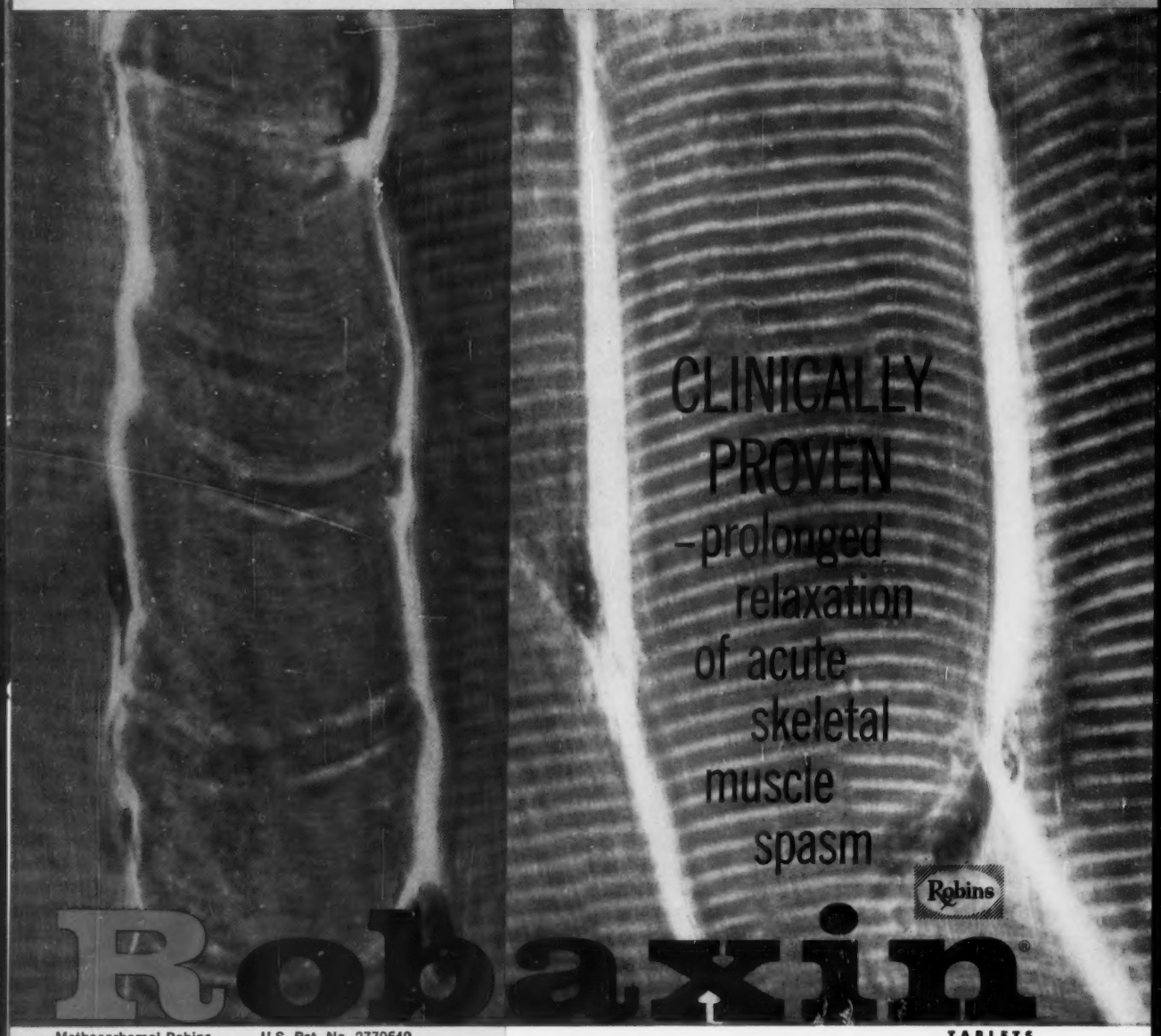
257A59

Fiber of skeletal muscle in spasm

Fiber of skeletal muscle relaxed *(photomicrographs)*



CLINICALLY PROVEN –prolonged relaxation of acute skeletal muscle spasm

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Methocarbamol Robins U.S. Pat. No. 2770649

TABLETS

Summary of six published clinical studies:

ROBAXIN BENEFICIAL IN 92.4% OF SKELETAL MUSCLE SPASM CASES

	NO. PATIENTS	RESPONSE			
		"marked"	moderate	slight	none
Carpenter[1]	33	26	6	1	—
		"pronounced"			
Forsyth[2]	58	37	20	—	1
		"good"			
Lewis[3]	38	25	6	—	7
O'Doherty &		"excellent"			
Shields[4]	17	14	2	1	0
		"significant"			
Park[5]	30	27	—	2	1
		"gratifying"			
Plumb[6]	60	55	—	—	5
TOTALS	236	184 (78.0%)	34 (14.4%)	4	14

- **Highly potent—and long acting.**[1,2,3]
- **Relatively free of adverse side effects.**[1,2,3,5,6]
- **In ordinary dosage, does not reduce muscle strength or reflex activity.**[1]

REFERENCES: 1. Carpenter, E. B.: Southern M. J. 51:627, 1958. 2. Forsyth, H. F.: J.A.M.A. 167:163, 1958. 3. Lewis, W. B.: California Med. 90:26, 1959. 4. O'Doherty, D. S., and Shields, C. D.: J.A.M.A. 167:160, 1958. 5. Park, H. W.: J.A.M.A. 167:168, 1958. 6. Plumb, C. S.: Journal-Lancet 78:531, 1958.

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afford a new degree of symptomatic relief from

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Minimizes the Hazard of Drowsiness on the Job

as compared with other preparations containing antihistamines

Unique 3-layer decongestant tablet development offers a combination of ingredients never before possible to put into a single tablet.

DRISTAN—*Faster In Therapeutic Action*

Regular Enteric Coated Tablet	3-Layer Uncoated Dristan Tablet
Disintegrates in 3 hours	Disintegrates in 7 minutes

Dristan Decongestant Tablets—afford *a new degree of relief* from the symptoms of sinusitis, nasal allergies, postnasal drip and the common cold by releasing:

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References: Annals of Allergy, Vol. 6. July-August 1948. Study of a New Histamine Antagonist, The Pennsylvania Med. J., Vol. 51. Clinical Study of a New Antihistaminic Drug—Phenindamine. Dristan Clinical Study.

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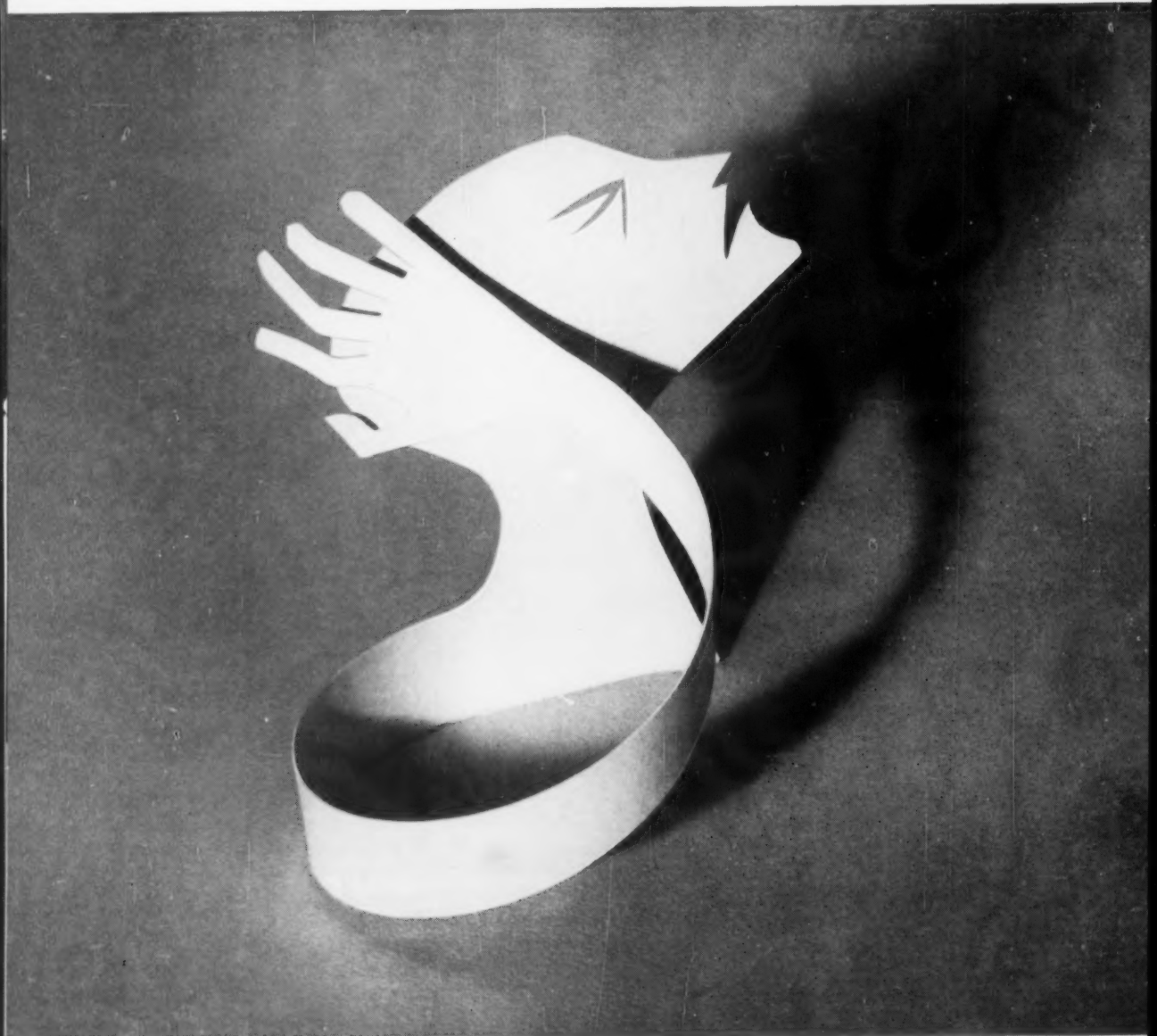
a safe, new way to prevent chronic HEADACHE



more effective than other drugs tested for the management of chronic or recurring headache

When SOMA was used prophylactically, "the frequency and/or severity of the attacks were decreased significantly in 73 per cent" with "severe and tenacious" tension headache.* These patients "were selective in that they did not respond satisfactorily to previous medical . . . treatment."[1]

RESULTS WITH SOMA

Therapy	*Per Cent Improved*
SOMA	73
All drugs previously tested (average)†	56
Placebo	50
(*Total cases: 60*)	

†Includes analgesics, antihistamines, CNS stimulants, hormones, sedatives, vasodilators, vasoconstrictors.

FOR PROPHYLAXIS OF CHRONIC HEADACHE: one 350 mg. tablet, q.i.d.; maximal effect is obtained in 3 to 5 days. To treat chronic headache: use a routine analgesic; at the same time start prophylactic treatment with SOMA.

SUPPLY: White, coated 350 mg. tablets, bottles of 50. Also available for pediatric use: orange, 250 mg. capsules, bottles of 50.

1. Friedman, Arnold P.: Clinical Application of Carisoprodol in the Treatment of Chronic Headache, Proceedings of the Symposium on the Pharmacology and Clinical Usefulness of Carisoprodol, Wayne State University Press, Detroit, 1959. p. 115.

SOMA T. M.

(carisoprodol Wallace)

The only drug combining analgesia with muscle relaxation in a single molecule

Literature and samples on request

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he'll be under way again soon, once he's on

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for muscle relaxation plus analgesia

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Each PARAFON tablet contains:

PARAFLEX® Chlorzoxazone† ..... 125 mg.

Specific for skeletal muscle spasm

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The analgesic preferred in musculoskeletal pain

Dosage: Two tablets t.i.d. or q.i.d.

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*sailor

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SUPPLIED: Tessalon *Perles*, 100 mg. (yellow); bottles of 100. Tessalon *Pediatric Perles* (for children under 10), 50 mg. (red); bottles of 100. *Also available* (for use when oral administration of Tessalon is precluded): *Ampuls*, 1 ml. (5 mg.); cartons of 5.

* Shane, S. J., Krzyski, T. K., and Copp, S. E.: Canad. M.A.J. 77:600 (Sept. 15) 1957.

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1. Grayzel, H. G., and Schapiro, S.: Western J. Surgery, Obstet. & Gyn., Oct. 1956.

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10 to 25 pounds	5 mg. per pound of body weight	every six hours
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In more severe infections, these dosages may be doubled.

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SELF-POISONING WITH LEAD

• PROF. DR. E. W. BAADER
Honorary Professor of Occupational Diseases
University of Münster
Westphalia, Germany

An alert physician often can detect cases of self-poisoning with lead that have been deliberately perpetrated to collect compensation awards.

In all civilized nations the consequences of occupational lead poisoning are compensated just as the consequences of a work accident. That means that the lead poisoned worker receives compensation for this industrial disease for the time of his disability. This causes unwilling workers and people of weak character to try to receive compensation for as long as possible by self-poisoning. How can you distinguish an artificially caused lead poisoning from a work caused one? This was a difficult task for the physician. There was no literature available when compulsory compensation for occupational lead poisoning was introduced in Germany 33 years ago.

Owing to favorable circumstances, I succeeded in discovering positive symptoms of deceitful self-poisoning by lead. In Berlin, in 1924, I founded the first special clinical department for the studies of connection between occupation and illness in Germany, and I have directed clinical departments for industrial diseases in the large hospitals for 31 years. During this time I was able to investigate thoroughly and passed judgment on more than 4,000 cases of lead poisoning. They were sent to me from all parts of Germany. From among them I unmasked 25 cases of deceitful self-poisoning. It is remarkable that the defrauders belonged to varied occupations working with lead. Among them were type-setters, painters, potters, lead-burners, workers in storage battery factories, smelters in lead-works, enamelers, scrapers and workers who mix colors. This tends to show how far knowledge of deceit is spread among lead workers. Having at hand such a large number of patients, it was quite natural that gradually I could gain some skill in judging the usual clinical course of lead poisoning. It happened that at first, just from clinical observation, I found it extremely strange and finally inexplicable that, contrary to all experience,

lead poisoning simply did not clear with some patients.

Strangely enough, these were poisonings which, in the beginning, had to be considered as mild or not so serious, but which lasted for years, although the patient had stayed away from all lead work in the meantime.

At first I looked for a source of lead not connected with work which might provide opportunity to the patient for repeated intake of lead; for instance tap water, food, tobacco, utensils containing lead, and so on. This search, however, was always unsuccessful. More and more I came to learn that after a gradual diminishing of all symptoms of lead intoxication, such as lead-line, anemia, cells showing punctate basophilia, suddenly a relapse of the illness started.

At first I tried to explain this by the scientifically nice thesis of elimination and remobilization of old deposits of lead from the bones. Here, however, the striking fact remained that with these apparent relapses a reappearance of the lead-line and cells showing punctate basophilia was often more strongly marked than during the first appearance of the illness immediately after leaving work. These relapses of the formerly almost cleared or considerably improved poisoning often coincided with the new settlement of compensation. Several times I saw patients who had received an award for industrial disease for four to five years because of poisoning attributed to leadwork. At annual intervals, shortly before the revision of their compensation, a strong aggravation of their old lead disease appeared, and they were able to prove evidently fresh symptoms of lead poisoning. At last I was startled by this fact. Today I know that at that time these persons were all insurance frauds who tried to deceive the expert on the duration of their illness by self-poisoning by eating lead in order to prolong their compensation for as long as possible. But only with patients eating lead too blatantly did I succeed in discovering the deception.

A worker in a storage battery plant had overcome his lead poisoning two years before, but still received a partial compensation. He was sent from the Rhineland to me in Berlin in order to find out whether his compensation could be abolished or whether it should be changed into a permanent pension since the disease had lasted for two years. The patient arrived with severe colic and vomiting, subicterus with an enormous swelling of the liver, well marked lead-line, abundant cells showing punctate basophilia and porphyrinuria. I told him that I knew of his deceit and he confessed having eaten scrap lead in small quantities. In his luggage a file and a piece of lead were found. (Figure 1). Here you

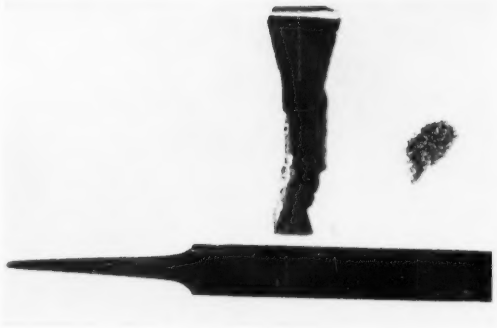

Figure 1

see the lead powder which the man made by scraping and ate every morning as an hors d'oeuvre. Later on I shall return to the important indices of elimination of lead in his stool and urine.

In all plumbophages intending to deceive, I found five points which may serve as a proof of attempted deceit:

(1) An essential characteristic to be found with simulants of occupationally received lead poisoning is the striking severity of the clinical picture of poisoning which is contrary to the more or less long period of time since leaving work. With most of the cases of lead poisoning the so-called cardinal symptoms of poisoning (lead-line, coloring, cells showing punctate basophilia, porphyrinuria) will completely disappear within some months. At least a gradual recovery is to be found in the course of the illness, shown by a decrease in the number of cells showing punctate basophilia and an increase of the indices of blood pigment. The decrease of colic and dyspeptic complaints are more difficult to determine, but here too, the end of the usual constipation and the increase in weight can positively be noted. Therefore, avoiding new leadwork, all occupationally received lead poisonings can be cured within an average time of six to eight months. A small number of poisonings will go on to a permanent stage for many years where signs of cachexia, obstinate subacid gastritis with or without anemia dominates the clinical picture. This condition can be subject to variations in the state of health, but it is impossible to observe here either a reappearance of the lead-line or the new appearance of a large number of cells showing punctate basophilia. Symptoms of this kind which were often explained as a "relapse" of the poisoning can be considered according to our present experience as being not within the reach of possibility. Certainly it is possible, according to our observations, that at or after intercurrent illnesses (angina, pneumonia, influenza) transitory ag-

gravation of chronic lead poisoning can occur with a renewed decrease of the index of blood pigment and the number of erythrocytes. An increase of cells showing punctate basophilia as a consequence of the mobilization of old deposits of lead is also possible.

These things are also well known among experienced frauds. They have generally made detailed studies in the literature of lead poisoning and therefore they like to speak of influenza or another intercurrent illness after which their state of health had turned for the worse. The plumbophages, however, used these "aggravations" too often, and this is understandable because it is the appearance of more serious symptoms of poisoning that opens to them the prospect of the further grant of the pension they hope for so earnestly. Therefore they produce a renewed lead-line, many cells showing punctate basophilia, often porphyrinuria and colic with constipation, thus causing those seeming "relapses" to be far more severe than the symptoms at the start of the disease. Sometimes it is also possible to convict a plumbophage by charting his blood picture on a graph during the time of clinical observation. Here it is always suspicious if large numbers of cells showing punctate basophilia are found in a lead worker who has stayed away from leadwork for a long time. Often this can be used as proof that there was a recent intake of lead, especially if their number decreases quickly in the course of a period of observation lasting for some weeks. As an example, there is shown here the curve of cells showing punctate basophilia of a man who mixes colors (Figure 2). During the clinical

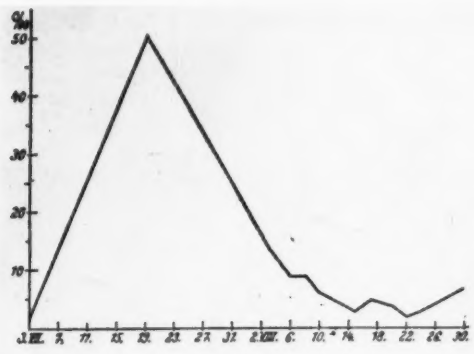

Figure 2

observation for a new settlement of his compensation he demonstrated a faked relapse of his old lead poisoning.

(2) In addition to those results of examination, the amount of lead excreted by urine and stool provides the most important hint of an intentionally produced lead poisoning. The amount of lead detected in the stool gives the most useful circumstantial evidence, as we were taught by the cases in our observation. In the older medical literature we often find an overevaluation of the proof of lead in the urine. It was believed that the presence of lead in the urine, detected qualitatively, made it possible to conclude the presence of lead poisoning. How false this conclusion was is shown by the works of Kehoe in America and Litzner and Weihrauch in Germany who were able to trace small quantities of lead in almost all examined persons by increasingly refined micromethods. The widespread distribution of lead in all civilized countries causes it to be absorbed in small quantities in food and tap water. Therefore it was right to assume the presence of lead in all normal urine. This excretion is not manifest and does not cause any disturbance of health. Of course the urine contains more lead if a larger quantity of lead is absorbed. A daily amount of 0.1 mg in the urine is generally considered as a critical value. If this amount is exceeded it is likely to be a case of lead poisoning. But it must be noted that even with evident lead poisoning, sometimes quantities of lead were found in the urine not larger than those found in completely healthy persons. This is because, during poisoning, lead is at first retained in the body, and then is excreted irregularly in the urine. Because of this fact we find it difficult to judge all indices of lead excretion in the urine. According to my experience the index of lead in the urine cannot be used as a proof of self-poisoning. Quite a different emphasis, however, can be attached to the examination for lead in the stool. The Americans Aub, Fairhall, Minot and Reznikoff just as the Germans Litzner and Weihrauch usually found levels of only 1.0 mg and as a maximum amount 2.83 mg in 100 g of stool in occupationally lead poisoned patients. After many years of experiments I have checked these figures and can confirm them, because all of my occupationally lead poisoned patients excreted between 0.5 and 2.8 mg lead in 100 g stool. According to my observations of occupational lead poisoning, within four weeks after leaving work the quantity of lead in the stool will always go down to quantities which are less than 2.0 mg and soon to fractions of 1.0 mg.

In the full conscience of my responsibility I therefore come to the conclusion that the suspicion of plumbophagy is justified, if more than 4.0 mg lead is found in 100 g stool in chronic lead poisoning four weeks after stopping work with lead.

(3) The ratio of lead contained in the stool and the urine is also worth considering in cases

of fraud. According to pertinent reports of the world literature, the quantity of lead in the stool will be 2.5 to 3.5 times greater than that in the urine. The results of the Americans Aub, Fairhall and their staff speak of an elimination of lead by feces which is 2.5 times greater; the Australians Badham and Taylor found this difference to be up to 3.0 times greater. As an average result of numerous comparative evaluations, I found the ratio of lead in one liter urine and in 100 g stool to be one to three. It was in plumbophages that this ratio was not to be found. For instance, we found 0. mg in the urine against 21. mg in 100 g of stool; in a different case, 0. mg in the urine against 44.2 mg in the stool; in a third case of deceit, 0.1 mg in the urine against 188 mg in the stool; in a fourth case, 0.16 mg in the urine against 251.1 mg in the stool, and so on. This may serve as proof of the fact that a large part of the swallowed lead was not absorbed at all, but quickly left the organism in the stool. But once again I point out that the excretion of lead in the urine often fluctuates, and therefore the fact that the index of lead in the urine remains behind that of the stool in itself gives no useful proof for self-poisoning. Nevertheless it can be said that the proof of lead in the stool is the clearest evidence against simulants. Therefore, the sooner an examination of the stool is carried through in a case of suspicious relapse (and for the accomplishment of which a thorough clinical observation is always necessary), the greater are the prospects of discovering the fraud by demonstrating a disproportionately large quantity of lead.

(4) Another interesting observation is to be mentioned here; it deals with the chance discovery of other metals when searching for the quantity of lead in the excrements. In most cases, the analysis of the stool proves the presence of pure lead. This corresponds to the material swallowed by most simulants of occupational lead poisoning, as far as they confessed the deception after their conviction. They had either eaten scraped soft lead, or powdered lead or minium. Sometimes, however, the quality of the material agrees with the occupation of the swindler and gives a further clue to prove the deceit. Thus workers in storage battery factories had swallowed either minium or scraped lead. In printing industry workers we repeatedly found antimony and tin as an admixture to the lead, just as it can be found in the alloy of the types. With a plumber who had to work with plumber's solder, the examination of the stool showed 2.19 mg lead and 6.86 mg tin. When one takes into account the simultaneous elimination of 0.77 mg lead in the urine, this corresponds exactly with soldering tin containing 30% of lead. (The customary bars of solder metal contain either 30% or 50% of lead.) Therefore it is necessary in these examinations to pay attention to admixtures of other metals.

Occasionally, for want of chemical knowledge, errors slip in. Thus they eat tin only, taking it to be lead; or iron minium confusing it with lead minium; and of course the expected success of the poisoning is lacking. Here too, I could indicate abundant experience.

(5) The x-ray provides us another important criterion. In every suspicious case, first an x-ray of the empty intestine is necessary. In many cases the swallowed lead can be discovered by x-ray for it causes an opacity in the intestine. The first patient who gave me the idea of x-raying the empty intestine was a former lead-worker, aged 62, who had reported sick because of industrial lead poisoning, and had finished work. His poisoning would not clear at all and therefore, two and a half years later, he was sent to me for appraisal. I found neither the lead-line, nor cells showing punctate basophilia, nor porphyrinuria. This, of course, did not fit into the usual pattern of consequences following the eating of lead. But the patient complained continuously about spastic abdominal pains which, he said, was the consequence of the lead poisoning he had received two and a half years ago.

However, the x-ray of those painful abdominal areas in an empty state showed four metallic foreign bodies with a characteristically sharp edge in the ascending colon (Figure 3). You see two of them on a level with the right ramus of the pubis and two of them are seen against the right upper part of the ilium. By a purgative I succeeded in getting two of these foreign bodies in the stool which exactly corresponded with the shadows of heavy metal both

Figure 3

in size and shape in the radiograph. These were two pieces of soft lead bent over in the way that they are used by anglers for weighting their fishing lines. (Figure 4). These bent pieces of

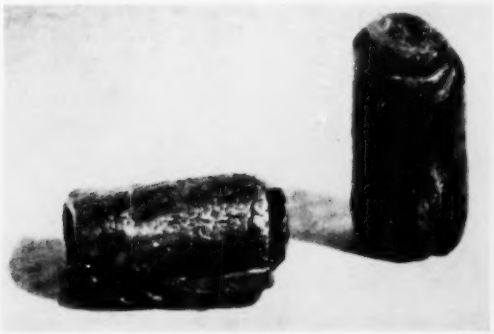

Figure 4

lead were eight mm high, five mm broad, and had a thickness of three mm. The first piece of lead was immediately brought forth in the stool and weighed 820 mg. The second piece appeared one month later and weighed 810 mg. This long stay in the digestive tract is remarkable. The other pieces of lead were still visible in the intestine on the patient's discharge, and neither enemas nor laxatives changed their position. The patient admitted to being an angler and finally confessed having swallowed the pieces of lead one day before entering my clinic with the intention to receive compensation because of lead poisoning. He had attempted deceit in a rather naive way because he did not consider the fact that those four bands of lead swallowed on the day before the examination could not be so quickly reabsorbed as to induce symptoms of lead poisoning.

Another fraud, however, was more successful. He swallowed large quantities of lead splinters and presented many cells with punctate basophilia, porphyrinuria, a blood level containing a large quantity of lead, and a lead-line. For four years he had not worked with lead and throughout all the years he had obtained compensation for industrial disease because of permanent "relapses" of his poisoning. Because of the long time the lead splinters stayed in the intestine and because of the obstipation produced at the same time, I was able to demonstrate the lead splinters clearly in the x-ray of the empty intestine, almost as an x-ray contrast medium the picture shows the course of the intestine filled with lead splinters (Figure 5). After a thorough castor oil treatment, a large part of the intestine was emptied and lead splinters are now mainly in the descending colon and in the ampulla. (Figure 6). The final

Figure 5

outcome, however, was a long imprisonment because of the deception.

Finally, I should like to show a picture which at that time caused me great difficulty in interpreting. While x-raying the intestine of a fraud I found the remains of an x-ray opaque

Figure 6

meal which was taken somewhere else and other opacities which, according to my experience, had to be pieces of lead. (Figure 7). In other cases I always found those shining pieces of

Figure 7

metal after having sieved the stool, but here this method failed. Had the man perhaps eaten the powder of a lead composition, for example lead mono-oxide, white lead or something like that which could not be discovered in the stool macroscopically? There was no information, however, about the appearance of these powdered lead colors in an x-ray.

I therefore ordered the head nurse to bake a cake containing white lead. (Figure 8). A dog was fed with this cake and x-rayed. Quite distinctly you could see the opacities of the

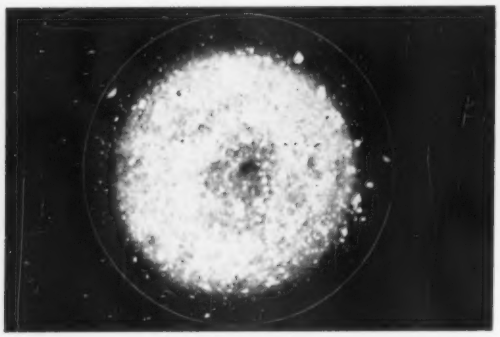

Figure 8

lead composition in the cake as well as in the dog's intestine (Figure 9).

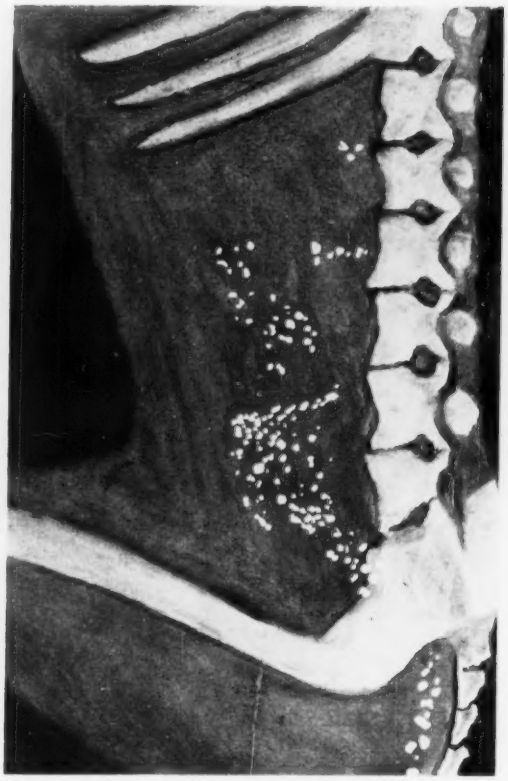

Figure 9

The dog's excrements containing lead did not differ at all radiologically from the stool of the plumbophage. (Figure 10). By this experiment it

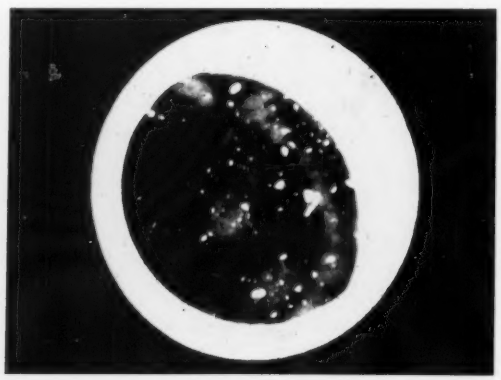

Figure 10

was proved that even those seemingly more clever simulants who swallowed the powder of a lead color instead of metallic lead can be dis-

covered by x-rays just as surely as the other group (Figure 11).

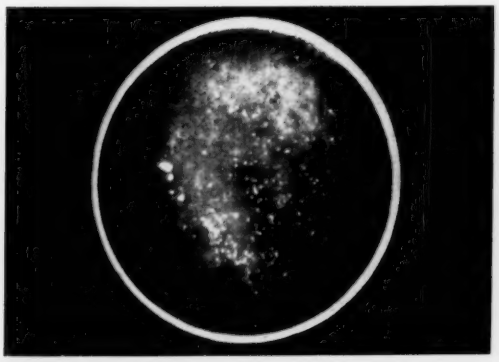

Figure 11

Finally, I should like to cite an example to demonstrate how cunning and narrow-minded some of the frauds may be. A worker at a type-setting machine, aged 45, had been receiving compensation for 21 months because of lead poisoning. Considering his occupation, it was extremely doubtful to me whether it was an industrial disease at all. As is generally known today, lead poisoning in the printing industry has become extremely rare and only accounts for 0.2% annually of all diseases in this industry in Germany. When the full pension was to be reduced to 70%, the patient went to law. In order to do him no wrong and to exclude a possible domestic source of lead supply, the tap-water and numerous utensils in the patient's flat were examined, but without any success. Likewise the examination of his family for signs of any lead intoxication had no results. After 15 medical reports, all of them confirming lead poisoning without trying to find out the reason why the illness did not clear, the patient was sent to the Berlin University Institute for Industrial Disease, which I direct, to get a final opinion. The task was difficult because the patient acted the part of an honest man and declared he was in a secure position, did not care at all for the compensation, and was only interested in getting healthy again. On admission he had a strong lead-line, numerous cells showing punctate basophilia, and porphyrinuria. The specimen taken immediately showed 5.1 mg lead in 100 g stool and 0.2 mg lead in 1.0 liter urine. Twenty-one months after finishing work such a quantity was extremely suspicious and therefore the patient was strictly controlled. All parcels coming from home were x-rayed, but at first without success. Gradually, the fresh signs of poisoning lessened and the patient became visibly uneasy, and wished more and more often to be sent home. He probably feared that with continuous improvement the estimation of his disability would change. We knew the result of his stool examination and hoped that the fraud, seeing the continuous improvement of his illness, would try to produce a "relapse" by new lead supply. We decided to go on with the observation. At Easter he received from his wife a registered letter which was remarkably heavy. We were not allowed to open the letter because of the inviolability of mail. But it was not forbidden to x-ray it. The x-ray showed a number of envelopes and in one of them the typical contrast shadow of a heavy metal (Figure 12). The letter

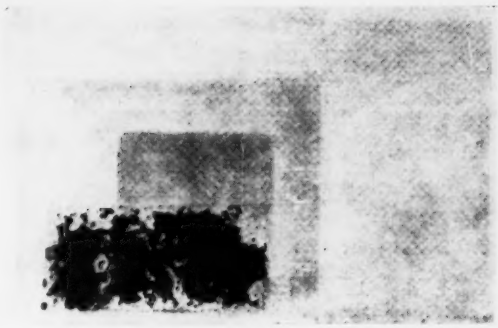

Figure 12

was confiscated. It contained a black and grey powder which examination proved to be lead, antimony and tin (so-called type-metal) affixed to sugar. The proportion of lead in this sugary stuff was 52.5%. The patient declared his wife's parcel to be an Easter joke. After a further supply of lead was prevented, his blood picture improved quickly. Also, the index of lead excretion in the stool quickly decreased from 5.1 mg to 0.05 mg. A similar deceit was discovered in another hospital where the fraud received a parcel of white lead.

Summary

(1) The marked clinical state of self-poisoning. In most cases it is remarkably prolonged with so called "relapses" which can hardly be explained and with usually more serious symptoms than the original occupational poisoning (assuming that such a poisoning was ever there).

(2) The quantity of lead eliminated by urine and stool. Four weeks after exposure, more than 4.0 mg of lead in the stool does not occur in the normal course of the disease.

(3) The proportion of the quantity of lead in urine and stool compared with each other.

(4) The demonstration of other metals in the stool beside lead.

(5) The results of radiography.

Post-Traumatic Personality Disorders

Including Neuroses and Encephalopathy

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One of the most common diagnoses made at the present time, especially in medicolegal cases, is that of post-traumatic neurosis. The patient with symptoms following injury presents a difficult problem, from the diagnostic as well as the therapeutic standpoints. In order to give a better understanding, I shall attempt to review some of the literature important to the subject and to give illustrative cases in an attempt to clarify the subject.

Leopold Brahdy and Samuel Kahn's text on *Trauma and Disease* includes a chapter on "Trauma and Mental Disorders" by Ebaugh and Benjamin in which they discuss the possible relationship of trauma and mental illness, mainly from the practical viewpoint. Trauma is viewed from the medical eye as physical injury, although psychogenic trauma may, and usually does, accompany injury. Although the factors and classification are pointed at mental illness, the classification also applies to the neuroses as well.

Under general considerations, they outline (1) that trauma may be a true causative agent, as in head injury with no previous history of any type of disorder. (2) Trauma may be a major precipitating factor. This occurs only in head injuries, but the illness may have been latent (not evident but lying dormant) and the trauma precipitates the illness. (3) Trauma-aggravating; i.e., there is a manifest psychosis or mental illness, but the clinical course is aggravated by the trauma. This also occurs usually in head injuries. (4) Trauma is only a minor precipitating factor. Again, there is a latent psychosis or mental illness present which would have become evident without the physical or psychological trauma. (5) There is no relationship to the mental illness whatsoever.

Wechsler classifies in the same volume these conditions under post-traumatic personality disorders; i.e. traumatic encephalopathy and psychoneurosis following trauma. (1) The traumatic constitution (traumatic encephalopathy); (a) simple type of subjective complaints of headache, vertigo, irritability, fatigue and impairment of memory; (b) with secondary psychogenic symptoms; (c) with malingering; (2) post-traumatic functional disorders; (a) post-traumatic hysteria (Ex. 2A), which is a true hysteria precipitated by trauma in an individual with an underlying neurotic personality; this is very important and quite common; this may be accompanied by malingering; (b) so-called "compensation neuroses," a hysteria in which the wish for compensation plays a leading role in the unconscious production of symptoms. This may also occur with malingering. (c) Traumatic neuroses, a neurosis which is usually hysteriform with pronounced anxiety features in which the psychogenic mechanisms differ from ordinary hysteria and in which trauma may be considered as one of a series of true causative factors. (3) Malingering or faking. Opinions vary from describing it as an underlying psychopathic condition to including all cases without known organic damage. In other words, some men consider any type in which there are no evident physical findings as being malingered; however, Wechsler defines, "The individual becomes a malingerer only when he consciously, purposely, in order to deceive or to evade responsibility, or to derive gain, feigns illness and voluntarily tries to reproduce signs and symptoms which he readily does not have or extravagantly exaggerates minor ones which he has."

Too frequently the diagnosis of malingering is made because of underlying hostility (Strauss and Savitzky) of the physician in individuals involving compensation cases. The conscious and purposeful production of symptoms singles the malingerer from post-traumatic hysteria. Wechsler found that in 1% of 100 post-traumatic neuroses there were 62 in litigation. In two there was hysteria with malingering. Ebaugh feels it is more common. Prolonged observation may be necessary to distinguish these conditions,

and sometimes even then may be impossible. Even when malingering has been diagnosed, one must rule out organic or functional causes, or the simultaneous existence of both.

Traumatic neuroses were originally described by Oppenheim in which neither organic disease nor psychoneurosis was found as the mechanism. Most of these were called post-traumatic encephalopathy. In this connection, Wechsler defined this condition as a condition in which terror accompanied the injury, rather than a physical effect. Terror neuroses, as also amplified by Strauss and Savitzky, occur more in catastrophies, such as earthquakes or wars, rather than in ordinary accidents. The symptoms may be similiar to those in an anxiety (acute anxiety state) in which dreams occur in which the patient relives the traumatic incident repeatedly. In severe head injury, amnesia may protect the patient from this type, and his condition is not complicated, tending to clear spontaneously. It is important to know that the pretraumatic personality is usually not neurotic and a head injury is not necessary.

Under post-traumatic functional disorders is compensation neurosis which is a form of post-traumatic hysterical neurosis in which compensation plays a dominant part in the precipitation of disability symptoms. In other post-traumatic neuroses, "the secondary gain from illness" is either less pronounced or directed toward other ends such as evasion of responsibility to avoid unpleasant situations. In both, unconscious conflict may be found.

These factors are important medicolegally: (1) Post-traumatic hysteria may occur without question of compensation; (2) in some cases, the natural desire for compensation is not important and the patient may improve with therapy without compensation; (3) here the findings show compensation is the greatest motive and therapy is ineffective. In such situations, lump-sum settlement without subsequent litigations frequently results in complete symptomatic cure. Ebaugh does not feel that compensation neuroses are found in the majority of post-traumatic functional disorders.

Post-Traumatic Hysteria

Neuroses following head injury usually are hysterical reactions undoubtedly due to specific redisposition of the hysterical personality using all possible abnormal situations as a means of escape from unpleasant reality and illness, as well as the abnormal degree of suggestibility of the hysterical personality. Patients, and most people in general, associate mental incapacity with injury to the head. This autosuggestion is fortified by relatives, friends, physicians and lawyers (iatrogenic or healer-suggestion illness is commonly recognized by physicians; probably not so commonly recognized by lawyers). The symptoms may be classic: functional paralysis, anesthesia, amaurosis (blindness), etc.

When the symptoms resemble simple traumatic encephalopathy, such as headaches, dizziness or true vertigo, fatigue, vasomotor disturbance, the diagnosis demands exclusion of organic brain disease and also the demonstration of the positive hysterical mechanism. Wechsler emphasizes the demonstration of negative evidence of organic disease and also positive evidence of hysterical reaction. It may be necessary in such cases to include formal neurologic, psychiatric examination, psychological tests, such as the Rorschach, electroencephalography, pneumoencephalography, ventriculography and even cerebral arteriography, as well as routine x-rays of the skull. It must be emphasized that post-traumatic encephalopathy is not easy to rule out and requires a careful, intensive neurologic investigation.

It is important to emphasize the difficulty in making a diagnosis between actual physical damage and functional disturbance following head injury. E. D. Friedman in "Head Injuries and Their Appraisal" (*Archives of Neurology and Psychiatry*, Vol. 27, pp. 791-810, 1932), studied 20 patients with skull injury, eight with definite evidence of skull fracture and two with bleeding into the subarachnoid space, who, with the exception of one, showed abnormal pneumoencephalograms. Because of this, Dr. Friedman revised his opinion relative to patients with so-called traumatic neuroses and considered them on a physical organic basis. Foster Kennedy, in the same volume, page 811, suggests that to estimate organic disability in a particular case, the following criteria of head injury sufficient to produce organic changes in the brain should be considered: Under (A) Absolute Findings, is (1) x-ray evidence of skull fracture; (2) blood in the spinal fluid; (3) bleeding from the orifices, such as eyes, ears, nose; (4) focal cerebral palsy. Under (B) Presumptive Criteria, in order of their importance, is (5) convulsive state (epileptic), proved to be post-traumatic; (6) pneumoencephalogram showing abnormal changes; (7) history of prolonged unconsciousness; (8) history of adequate injury (trauma) with special consideration of the occurrence of vomiting following the injury. These are very important criteria and must be utilized by the physician in evaluating the diagnosis and prognosis.

Schaller and Somers point out the other extreme of hostility toward the patient. They state that in many cases a doctor may establish doubt

and cause a fear state, because he frankly states a bad prognosis based on insufficient evidence. This might be unintentionally done by a too-sympathetic attitude or too long continued (unnecessary) treatment of a special nature, such as a long and unnecessary wearing of body braces and casts by patients with neuroses involving the back. It might be advisable for the specialist not to commit himself to the patient as to prognosis, as conflicting statements seriously influence the patient.

Schilder makes an intensive report on psychic disturbances following head injury. He reviewed 35 selected cases of serious head injury with positive skull fracture, bloody spinal fluid, deep unconsciousness with clouding. In these patients, there were definite objective signs to prove the severe disturbances on a physical basis.

Bing and Haymaker, in discussing traumatic neuroses, consider them to be the same as compensation neuroses. They bring out the fact that before insurance compensation these conditions were relatively unknown. Not only is there a demand for what insurance allows, but also "pain money." This conception has been present even before injury. After injury, there is fear that the patient's complaints will be minimized. The patient then becomes preoccupied with himself and the increasing intensity of symptoms. Because all neurotic individuals exaggerate their symptomatology, they are called malingerers. Many have been diagnosed as premorbid neurotic personalities. In Germany, these patients are given monthly payments, which only propagate the neuroses. In Switzerland, there is a cash settlement. Such is, or has been, the case in Denmark, Sweden and England. This makes the patient more interested in going back to his previous occupation.

Fright or terror neuroses may occur after severe frightening experiences. These need not necessarily be physically severe. The symptoms resemble mainly acute anxiety and occasionally manic excitement. This may develop into a traumatic neurosis when compensation is a factor.

Strauss and Savitzky emphasize the "unwarranted hostility and antagonism" associated with neuroses following head injury. They also bring up the "compensation for injury" as part of the "psychosocial equipment of the individual"; the aspect of his attitude towards reality, so that when injury is sustained by the patient, there ensues a rapid, unconscious wishing for compensation. They ask the question, "Can such influences be considered etiological factors?" In their experiences, they have encountered three types of neuroses: (1) terror neurosis, as has been previously described, not necessarily in head injuries; (2) psychoneurosis precipitated by trauma; (3) neurosis with secondary psychogenic elaboration. It must be remembered, as they mention, that trauma or threatened trauma to any part of the body can precipitate any of these psychoneuroses. In the treatment of psychoneurosis, they emphasize prevention. (1) Terror neurosis usually clears up if not complicated. (2) They suggest that the physician should become interested in treating these injured — not act as adjusters. (3) The medicolegal question should not be discussed with the patient. (4) These patients with psychoneuroses should be treated for their illness. (5) The injured should be kept at work if at all possible; idleness should be avoided. (6) Lump-sum settlement should be accompanied by physical therapy and psychotherapy. Reopening compensation negotiations after lump-sum settlement should be made increasingly difficult.

George W. Hall and Roland P. MacKay, discussing post-traumatic neuroses, emphasize them as a definite entity — not physical — with a diagnosis which should not be made by exclusion, similar to any other psychoneurosis. Their classification consists of (1) post-traumatic neurosis in which fatigue (not that associated with physical conditions) and irritability are associated with emotionalism; (2) post-traumatic anxiety neurosis, which is bodily preoccupation, anxiety symptoms, headache of the pressure type and hypochondriasis; (3) post-traumatic hysteria; this is the most common and usually with neurologic symptoms which do not follow anatomical pathways. They are usually in combined form.

In most of these cases, the attempt at treatment may fail because the patient lacks a desire to get well. When this occurs, both doctor and patient may give up, and the patient goes elsewhere, shops around and may get deeply involved. In most of these cases, the personality before injury is usually neurotic, but this may be difficult to elicit and may require a lot of study to prove this point; i.e., the trauma is usually precipitating in the neurosis, but the symptoms are not conscious, as in a malingerer. Again, treatment is emphasized as being difficult, and the points made by MacKay and Hall are (1) don't antagonize the patient; give him all of the help you can medically; (2) usually financial settlement is necessary; (3) the patient should be occupied with some type of activity; (4) patient should be given a reason to recover. All forms of treatment should be used, including medical, physical therapy and psychotherapy. Treatment should not be unduly prolonged, for this only fixes the patient's attention on his ailment.

Case Histories

An example of a post-traumatic cerebral concussion syndrome with major disability of hysteria and neurosis. (Example of 1 (b))

C. C., 30 years old, is married and has three children. His mother and father are living and well and there are two younger sisters living and well. His past history reveals a normal birth and childhood. Patient attended two years of college and also served as a Marine without difficulty. His past surgical history includes an operation for varicose veins. Three years previous to examination, the patient's head hit a window in a train cab, while he was employed as an engineer on the railroad. As a result of this injury, he was off work for 93 days due to a greenstick fracture of the skull. Following the accident, his symptoms were double vision for several days, headaches, an upset stomach and dizziness. He finally returned to work, but stated he had recurrent headaches which caused him to lay off from work twice a month. This means he has a neurotic personality and is predisposed to invalidism. Otherwise he had been well until approximately one month before my examination when he stated that a metal flat on a passing train struck his head. He was knocked unconscious and said he saw stars. He was up after a few minutes, and later drove a distance of 40 miles to his home. He stated that he saw double while driving, had a sick headache and was nauseated. While at home, he complained of headaches which felt like severe pressure. The day following the injury, he felt "woozy," vomited and couldn't eat. A diagnosis of brain injury was made, and he was off of work. The following day he was re-examined and advised that nothing was wrong and that he should return to work. The third day he was seen again by a "nerve specialist" who recommended that he lay off a few days and then return to work. While working, he had a spell in which he says he "turned white." He was then advised to stay away from work for another week.

I saw the patient approximately a month and a half later. He complained of nausea, anorexia, headaches (like pressure), and stated that his eyes blurred and he felt unsteady. On my initial examination, I found that he had loss of, or decreased sensation to pinprick, cold and vibration sense from the right lower extremity to the middle of the thigh. This did not follow anatomical pathways. On placing the right heel onto the knee, he did this in a bizarre fashion, which was not consistent with any type of known neurological disorder. Otherwise the examination was essentially normal. The skull x-ray and EEG were also entirely normal.

He was re-examined approximately two months later. He was still not working and complained of dizzy spells in which he felt like he was whirling. These lasted from five to 15 minutes and compelled him to lie down. He felt weak and stated also that he had passed out several times in the past month, one time in the house and one time out on the lawn.

Examination at this time revealed no reflex disorder, no weakness or spasticity, no cerebellar signs. There was still decreased sensation to pinprick, and cold sensation in the right leg, which was not anatomical. There was decreased pinprick sensation in the left arm. Vibration sense was decreased over the left forehead. On attempting to walk, he staggered, mainly to the left; yet, when his eyes were closed, he was able to stand on one foot with perfect balance.

In summary, this man, predisposed to neurotic symptoms, sustained a definite cerebral concussion following which he was having symptoms of vertigo and possibly spells of unconsciousness; however, the objective neurologic signs were not due to physical defects, but rather those of an hysteria, which is often seen embellishing the organic syndrome. These symptoms often are more difficult to treat than where actual physical damage is evident.

(An example of a patient who developed a post-traumatic neurosis engrafted on a definite skull injury with marked depression, in which litigation had nothing to do with complicating the symptoms, but other events in her life caused the symptoms to take on disabling proportions. Example of 1 (b))

This lady states her age as 50. Her husband had died two years previous to my examination. Her occupation was schoolteacher. Her past history, otherwise, showed little of significance except that she had received treatment for menopausal symptoms over the past four to six years, which would indicate neurotic aggravation. Three years previous to my examination, she had been hit by an automobile and rendered unconscious for approximately one hour. She awoke in the hospital where she had headaches and peculiar feelings in her head with buzzing and deafness in one ear. She was in the hospital for about six weeks. Following her hospitalization, she noticed a lack of energy; she had "peculiar feelings" in her head and her hearing was poor. After being home for three months, she returned to work, but feels that she has not been doing a good job. A year after the accident her husband died.

Her complaints include numbness of her tongue with a salty taste. She feels that she had difficulty speaking, as though there were a sore on her tongue. She states that the joints of her

jaws get tired. She consulted an oral surgeon who wired her jaws for months, without benefit. She has since gone from one specialist and one clinic to another, but has accepted no diagnosis, feeling that no one has gotten to the root of her problem. In addition, her main complaints are that she can't talk, tires easily, has lost weight; there is an abnormal feeling of the tongue, pain down her shoulder, pressure in her ears, irritability; she has lost interest in things and cries easily. Whereas normally she is an energetic person, "like a ball of fire," and is ordinarily very happy, she now has no pep and cannot enjoy life.

Neurologic examination revealed a depressed-looking individual who was obviously quite preoccupied with herself. The only objective findings were that there was a mild deafness in the left ear, a mild weakness of the jaw muscles on the left side; pinprick was felt slightly better on the right side of the tongue than on the left.

The diagnosis in this case was a definite old cerebral concussion with minimal injury to the 5th and 8th cranial nerves (face feeling and hearing), but, for the time after injury and the minimal disability, this lady was quite disabled emotionally. Diagnosis: Post-traumatic cerebral concussion syndrome, or encephalopathy with neurosis (hysterical type) with marked depression. There was no law suit in process, as this case had been settled at least a year before my examination.

Office treatment was attempted for a while, but this patient was not sufficiently responsive to avail herself of such treatment. In this type of case, treatment is difficult, and it may even be necessary to hospitalize the patient for psychiatric care and shock-like treatment.

(An example of a post-traumatic hysteria. Example of 2 (a))

Mrs. S., a married, 34 year old woman, gives a fairly normal past history. She is a high school graduate and trained as an interior decorator. She married at an early age, and after 11 months was divorced because of incompatibility. She has a son from this marriage. She has now been married a second time for 10 years. They have no children by this marriage; both are happy and working. She is in the advertising business and is quite successful. She gives a history of an abdominal injury at the age of four and an ovariectomy 10 years ago for bleeding.

In July of this year of examination, a month prior to consulting me, she was riding in a car. She remembers seeing a yellow car approaching, and the next thing found herself out in the street on a stretcher. She was aware of pain in her right arm. She was taken to the hospital where x-rays were taken, and she was then sent home. She is presently under her physician's care. She was referred to me because of a severe shaking of her right upper extremity. She complained that she could not hold her arm still. She is quite weak and shakes all of the time. She is unable to work because she is "in the public eye."

Examination revealed an attractive woman who is not too unhappy, in spite of the fact that she states her right arm shakes all the time. However, on attempting to walk, there is a perfectly normal gait and the arm stopped moving. I could elicit no weakness or neurologic defect in the lower extremities. All deep reflexes are normal; there are no pathologic reflexes and no sensory defects. There are two abdominal scars. The superficial abdominal reflexes are normal. The left upper extremity is normal. The entire right arm is involved in a fast, bizzare, coarse tremor regardless of position. On attention, this stopped completely. I could not detect any weakness, and any weakness found was volitional. With the weakness, there was no atrophy. The muscles, however, in the shoulder, arm and elbow were tender. The cranial nerves were all within normal limits.

Because of the bizzare nature of the findings, and her tremor, which disappeared when it should be continuing, I made a diagnosis of a post-traumatic hysteria and suggested psychotherapy. This case was in litigation, but she was a very cooperative person and very concerned about herself. She came to see me by appointments regularly, and she was given electrical treatments, which are uncomfortable to bear, but with each successive treatment, the arm calmed down. After a few months, the tremor had disappeared entirely and she was working and happy. She made a recovery in spite of the fact that litigation was in progress. This case was subsequently settled. The lawyers and family could not understand that she could have any type of "nervous tremor" since she was such a well-adjusted individual all of the time and had held very responsible positions without previous nervous difficulty. However, events proved that this was a definite hysterical neurotic tremor which responded to psychotherapy.

(Example of 2 (b))

A young man, seen by me following an injury to his back, states that he is 30 years old, married, and has two children. He has been working steadily, but in the past history a significant finding is that, following an elective operation (herniotomy), he developed all types of symptoms which delayed his recovery considerably, from a few weeks to months. He finally returned to work and had no difficulties until two years

later when he states he accidentally fell while at work, and from that time on had a lot of pain in his back, which he says is "all over his body." His report of a fall was found to be false. When I saw him, he was lying in bed in a most awkward and bizarre position, fearful of moving or not moving; he would not cooperate because he said it hurt too much to move. His attitude, posture and gait were not compatible with any type of known physical disorder. He refused to get out of bed to move his extremities or demonstrate to me how he walked.

Neurologic examination revealed no reflex changes, no sensory changes, no cranial nerve disturbances and no cerebellar signs. The only significant reaction was his lack of cooperation and his subjective complaints of "pain all over," which could not be described or localized. It was suggested that he be given a course of intensive physical therapy with electrical stimulation, which sometimes is a little painful and stimulating. With intensive treatment, he improved sufficiently to enable him to go home within a few weeks. However, he never returned to work, nor for follow-up treatment, and soon after leaving the hospital he engaged the services of a lawyer.

This man is a definite hysterical and malingering individual who is litigious and is on the lookout for injuries in which he can collect compensation. Such individuals need careful personality evaluation. In this instance, when the patient's neurotic personality was diagnosed following his elective surgery, he should not have been allowed to go back to work. This, of course, would be difficult under many of our labor and compensation laws.

(An example of hysterical reaction to real injury, causing an unusual condition which is partly physical and partly hysterical, referred to as reflex physiopathic disturbance. Such disturbances were quite common in World War I. — Babinski and Froment. Example of 2 (b) & (c))

This young man had been married for the second time. He gave an entirely normal past history. His service record was normal; however, from other sources, it was found that he was an only child and a spoiled one, who did very little in a mature fashion. He was working as a welder for about a year.

He came into the office treating his entire left upper extremity as though it did not belong to him. Three months before my examination of him he had accidentally hit himself on the back of his left hand with a hammer, after which the hand became swollen. It was markedly swollen and he had no motion in the fingers, hand, wrist, arm or forearm. He was off work and was treated with heat and massage for a few months, but the arm became more paralyzed and more swollen as time passed. He did not use it and was not made to use it at any time.

Neurologic examination revealed a paralysis of the entire left upper extremity and loss of all sensation to about the middle of his forearm. Faradic electrical reaction was absent, but, after elevating, to reduce the swelling from retention of fluid, the arm showed that the muscles did respond to faradic stimulation, showing that the nerve was still intact.

The diagnosis in this case was a reaction of hysterical paralysis due to pain and causing immobility. This has been described as a reflex physiopathic disturbance. In this condition, an actual minor injury causes a local physical disorder which spreads to involve an entire extremity, causing more disability than ordinarily seen. He was hospitalized for approximately six weeks, during which time he was put on intensive physical therapy in which stimulation to movement was accomplished by the use of electrical currents, and then he was encouraged and persuaded to use the hand in spite of pain.

After about six weeks, the hand looked about 95% normal, and he again had use of his fingers and his hand, although the feeling was not entirely normal. The problem then was to return him to work. He was sent back to work on limited disability, but this man felt, perhaps unconsciously, that he was getting more money when he was off work than while at work. Numerous attempts were made to get him back to work, but he refused to work. Finally, after several months of follow-up, it was found that he had recently engaged the services of an attorney, and we felt that we could no longer treat him until his case was settled.

In reflex physiopathic disturbance, usually the pain following injury causes the patient to stop using the limb. With a lack of use, many physical abnormalities occur, such as swelling, stiffness (from disuse) to the point of paralysis, and nutritional change. If the physician does not recognize the need for movement in spite of pain, this condition may become disabling.

(An example of a true post-traumatic hysteria subsequent to a definite physical injury to the body. Example of 2 (c))

A 38 year old male, married and with two children living and well, mother living and well, father dead (cause unknown), two sisters and four brothers living and well, is the third oldest and gives a history of a normal birth. There are no significant illnesses in his past history, and he has been working on the railroad fairly steadily for the past eight years. He served four years in the Army without difficulty.

A month previous to my examination he fell out of a train boxcar, having slipped on debris, and landed from a height of four feet on his back across a trestle. He was able to get up, and the medical department told him to come in over the weekend for x-rays. They reported that he had a fractured rib. He also had pain in the midback. He tried to work and take heat treatments, but the pain became worse. Three months following the injury he stopped work. He had been treating himself with linament and pills. After a month of home treatment, he entered the Veterans Administration Hospital where no physical damage was evident, and he was given physical therapy for one week without significant relief. He states that he cannot work, but has had no treatment.

His main complaints are of pain over the lower part of his back and chest radiating to the arms, neck and also down from his back to his legs. In his words, "My whole body is wracked with pain." He is unable to do any work, and just lies around the house.

Neurologic and physical examination revealed no objective evidence of back disorder. There was a normal Lasegue sign (no pain referable to back); no Hoover sign to indicate weakness or pain; all deep reflexes were normal; the superficial reflexes were normal; there were no pathological reflexes and no sensory changes, except that there was decreased appreciation to pain and cold and vibration sense over the left leg which extended up to his midchest and fluctuated with suggestion, and, in addition, did not follow any known anatomical pathways. Otherwise, the cranial nerves and fundi were normal. There was tenderness over his back. There were no meningeal signs.

The diagnosis here was a post-traumatic hysterical neurosis, manifesting subjective complaints of pain all over the body and objective signs of sensory defects which do not follow known anatomical pathways. Treatment in such a case is usually unsatisfactory, but would include intensive physical therapy and neuropsychiatric therapy, and might be successful only after settlement of his legal claim.

(An example of a superimposed neurosis which disabled the patient following definite physical injury with an additional physical disorder. Example of 2 (c))

This man was 55 years old, but looked to be a man 75 years old. He was a good worker. Approximately two years ago, he sustained a definite back injury in which he fractured a lower dorsal vertebra. This was treated for a few weeks with rest, following which he was allowed to go home for a time, wearing a body cast. While at home, he developed a variety of emotional symptoms, including panic, fear, anxiety, nausea and vomiting. He became fearful of his life and was quite depressed. He blamed his backache for being the cause of all of his trouble.

When I examined him, he was in a state of severe mental depression with a multitude of complaints. He was too despondent to be treated in the office. I suggested that he be hospitalized for intensive physical therapy and psychotherapy. This was done. While in the hospital, it was found that he had a fractured vertebra with considerable arthritis in the dorsal and lumbar spine. On much intensive psychotherapy, heat, massage and electrical stimulation to his back, the patient came out of his depression and gradually began to increase his physical activities, and subsequently returned to work; however, this required about two months of hospital treatment. On a program of light work and appropriate treatment, he was all right until about one year later when he again accidentally fell. This again aggravated the arthritis of his back and necessitated confinement to his home where he again became emotionally disturbed and depressed. On admission to the hospital, he had definite neurologic signs of back trouble; a bilateral Lasegue sign, a Hoover sign and altered ankle reflexes. The physical signs were compatible with the type of pain of which he complained in his back and radiating down into his legs. He was again put on an intensive physical therapy program with heat and massage, exercise and psychotherapy. After about two months of hospitalization, he was able to go home, and finally, on a continued program of physical therapy, he was returned to work.

In this case, a man having a labile emotional personality with a pre-existing arthritis, sustained an injury. His personality reacted with hysterical symptoms which disabled him more than the physical difficulties. All of these factors must be reckoned with. In this case there were no legal complications.

(This is an example of a man who has a mild neurosis which does not disable him, but injury exacerbates the neurosis and causes him to be more disabled.)

This man was 60 years old, married, and had grown children. His history was essentially normal except that he had sciatica about 20 years previously, and while in the Army he had injured his stomach which had necessitated surgery; he was all right in about six months. About 15 months prior to my examination, while at work, he fell from a step-ladder, onto his back. He was unconscious for a short period of time, and was then able to get up, but had pain in the back of his head and back, and he felt

quite panicky. He refused medical attention and was able to return to work the next day. However, because of headache, dizzy spells and a feeling of unsteadiness, he consulted a doctor, but without relief. He still had pain in the back of his head. He went from one doctor to another in panic, which increased with his fear over his complaints. He then went to a Veterans Hospital for two and a half months. He states that while there he was sick all over and was transferred to the psychiatric unit for two and one-half months. Subsequently he felt somewhat better, but still complained of being weak, having headaches and dizzy spells. His back hurts more on exertion. He has returned to work during the past several weeks, but still has complaints.

Examination revealed an anxious individual who sweats easily. His blood pressure was 160/90 and his pulse 120. All deep reflexes were brisk, equal and active. There were no pathological reflexes and no sensory disturbances. There was a scar over his abdomen. There were no cerebellar signs and no ataxia. The cranial nerves all seemed to be within normal limits. There was some tenderness over his low back. There was no Hoover or Lasegue sign as physical evidence of back disorder.

In this case, the patient had a definite cerebral concussion, and, because of his previous neurotic symptoms, this was exacerbated, causing him to go into a definite mental depression. He improved with psychotherapy and was able to go back to work.

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Beware the Bee

The bee is almost as deadly as the rattlesnake statistically and perhaps a faster killer.

During a five-year period the common bee chalked up a grand total of 52 persons known to have died from bee stings. The notorious rattlesnake accounted for 55 deaths.

There was a total of 215 deaths, with an average of 43 a year, due to the bites and stings of venomous animals and insects, according to a report in *Archives of Internal Medicine* (Aug.).

The Hymenoptera — bees, wasps, hornets, yellow jackets and ants — killed 86 persons. In contrast, all poisonous snakes together — rattlers, cottonmouth moccasins, coral and "unidentified" — killed 71 persons. Death from bee stings was usually faster. Several hours usually passed between snake or spider bites and the victim's deaths, while most Hymenoptera stings resulted in death within one hour.

More children died of snake bite than from bee stings, reports Dr. Henry M. Parrish of the University of Vermont College of Medicine, Burlington. This is probably due to the fact that bee sting deaths are actually severe allergic shock reactions and the person must have been sensitized to the insect venom, he says.

As a result of his study, Dr. Parrish believes that previous estimates of the incidence of bites and stings by venomous animals are far too low. Although venom poisoning can not be classed as a major medical problem, he says, it is much commoner than formerly recognized.

Since the venomous animals and insects are found in every state, a physician should find out which species are indigenous to his state, become familiar with the clinical manifestations of venom poisoning, and keep up with the latest therapy, Dr. Parrish concludes. —*Science News Letter*, September 12, 1959

This report is essentially a review of techniques described in the literature with which the author has become familiar through personal experience. An example of the use of these techniques as applied to a series of industrial tasks is included.

Evaluating

HOT ENVIRONMENTS

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The human body's ability to maintain a relatively constant temperature is a chemical and engineering marvel. To maintain this state of thermal equilibrium, the body utilizes a unique temperature control mechanism.

If we wish to control temperatures within our dwellings or business establishments, we normally do so by increasing or decreasing the output of our heating units. Thus, in winter we burn more and more fuel as the weather becomes colder, while in summer the furnace is shut off.

This method of heat control is not available to the human body. Its "furnace" will, during the performance of any given task, generate the same amount of heat in either winter or summer. This quantity of heat is the sum of two components: a relatively constant basal metabolic heat production, plus the metabolic heat resulting from the fluctuating energy requirements of the task.

The basic rate of heat generation within the body as a result of cellular metabolism does not normally vary in response to heat stress. The body maintains its state of thermal equilibrium primarily by mechanisms for regulating its rate of heat loss.

To dissipate metabolic heat and thus maintain thermal equilibrium, the body resorts to two fundamental mechanisms, radiation and evaporation. In environments which we term comfortable, approximately 60% of metabolic heat is lost by radiation;[1] the remaining fraction of metabolic heat is lost by evaporation into the air layer surrounding the body. The vapor-laden air is then removed by convection. Other minor methods of heat transfer, for example via the respired air and loss in urine and stools, are generally considered insignificant. On a percentage basis, they normally have little effect on the over-all heat balance of the body.

Presented before the Western New York Section of the American Industrial Hygiene Association, October 6, 1958.

Equilibrium Disrupted in a Hot Environment

Heat exposures may be categorized as being either hot-dry or warm-moist. In a hot-dry environment the body's mechanism for maintaining thermal equilibrium may be seriously strained. Rather than losing heat by radiation, the body will be warmed if the solid objects surrounding the worker are hotter than skin temperature. If the radiant heat gain exceeds the capacity of the sweating mechanism to provide sufficient cooling, body temperature will rise.

In a warm-moist environment a different type of strain is imposed. The heat load from radiation may not be great, but the hot humid environment severely limits the cooling effect which can be provided by the sweating-convection mechanism. Body temperature will rise when the maximum evaporative capacity of the environment is insufficient to permit the dissipation of the body's heat load.

Measurement of Heat Stress

Heat effects on man have been studied by such techniques as the effective temperature charts and the predicted four-hour sweat rate. The armed forces particularly have studied the effects of heat because of the severe exposures encountered by service personnel under some combat conditions.

Within the last few years, two reports by Haines and Hatch[2] and Belding and Hatch[3] describe a method of evaluating the stress imposed on a worker by a hot industrial environment. They also permit an estimation of the resultant physiological strain. Anyone striving to assess the hazards of a hot environment should certainly consult these reports and study them thoroughly.

The theoretical approach used by these authors is based upon the estimation of the constituent factors of the basic equation of body heat balance. Reduced to its most workable form this equation may be expressed as

$$E_{req} = M \pm C \pm R$$

The evaporative capacity (E_{req}) required to maintain body heat balance is equal to the sum of the heat loads imposed on the body by the metabolic process (M) by convection (C) and by radiation (R). Although other units may be used, these factors are normally expressed in B.T.U.'s per hour.

It should be noted that C and R usually will be negative values since convection and radiation represent mechanisms by which the body dissipates heat. In hot industrial environments, however, one or both of these values may become positive and represent sources of environmental heat stress.

The first step in the practical application of this method for determining heat stress involves the measurement of four environmental parameters: (1) ambient air, or dry bulb temperature (T_a); (2) wet bulb temperature; (3) black globe temperature (T_g) and (4) air velocity (V). All these measurements easily can be obtained. The simplest instruments for this task would include a mercury thermometer shielded from radiant heat, a sling psychrometer to give wet bulb temperature, and a globe thermometer. A serviceable black globe thermometer can be made from a spherical, hollow, copper float (a six or eight inch diameter boiler float or toilet float can be used) through which a hole has been drilled. The globe is painted with dull black lacquer and a thermometer is placed through a cork stopper in the drilled hole so that the thermometer bulb is in the center of the float. Such a globe will reach heat equilibrium in about 20 minutes. Air velocities are best obtained with a relatively nondirectional type instrument such as the anemotherm. These basic instruments may be refined to include in addition recording thermometers which may prove convenient.

Having determined the four environmental parameters, we utilize the following equations proposed by Belding and Hatch:

$$C = 2\sqrt{V}\ (t_a - 95)$$

and $$R = 22\ (t_w - 95)$$

where $$t_w = \sqrt[4]{T_g^4 + (.103 \times 10^9 \sqrt{V})\ (T_g - T_a)}$$

The term t_w represents the average temperature of the solid surroundings and may be thought of as wall temperature. Solving these equations gives us values for the heat loads resulting from radiation and convection. The same information may be obtained by those having little love for mathematics by consulting nomographs given in the previously mentioned reports. Representative values for the metabolic heat produced in various degrees of physical activity are given by Belding and Hatch so that it becomes possible to determine the value for the full heat load imposed upon the body, M + R + C.

We can calculate the total heat load imposed by the combined effects of metabolic and environmental heat. Does this heat load represent a health hazard? To answer this question, we must realize that the human body can be subject to two types of heat strain: (1) heat accumulation due to the failure of the working environment to permit evaporation of sweat and (2) overtaxing of the body's sweating mechanism. The first type of strain is typical of a warm-moist work site, while the second will be found in the hot-dry industries.

The maximum evaporative capacity (E_{max}) of the working environment depends on air velocity as well as the vapor pressure of water both in air and at the skin surface. Sling psychrometer readings permit the determination of the vapor pressure of water in air (VP_a). We may substitute in the following equation:

$$E_{max} = 10.3\ V^{0.4}\ (42\text{-}VP_a)$$

This equation has been derived on the assumption that skin temperature is 95°F. (an assumption erring on the side of safety). Again, nomographs permit the determination of E_{max} without recourse to the equation.

If E_{req} exceeds E_{max}, the excess, as indicated by E_{req}-E_{max}, represents the rate of heat gain by the body. The average man will undergo a 2°F. rise in temperature for each 250 B.T.U.'s

gained. This rise is assumed to be the maximum that can be tolerated without untoward effects. It follows that the ratio 250/ (E_{req}-E_{max}) represents the permissible exposure time in hours. This limit governs the exposure of the healthy, acclimatized, seminude male upon which these considerations are based.

The human body subjected to an increasing heat load will respond with an increasing sweat rate. There is, however, a limit to the amount of sweat which can be produced. For practical purposes Belding has taken this limit to be one liter per hour. The evaporation of one liter of sweat will dissipate 2,400 B.T.U.'s.

Considering the results of extensive physiological research, Belding and Hatch make the premise that the average, young, heat acclimatized male cannot sweat at a rate greater than one liter per hour for eight hours without undergoing deleterious effects. Such a sweat rate is assigned a Heat Strain Index (HSI) of 100 and is reached when E_{req} equals 2,400 B.T.U.'s/hr. In other words, where the limiting factor is the body's sweating capacity:

$$HSI = \frac{E_{req}}{2400} \times 100$$

Where the evaporative capacity of the environment is limiting (i.e. less than one liter per hour), the heat strain index must be based on E_{max} as shown in the following equation:

$$HSI = \frac{E_{req}}{E_{max}} \times 100$$

Under these latter conditions, a HSI of 100 is reached when $E_{req}=E_{max}$. Again, this is considered the maximum that the healthy young adult male can tolerate for eight hours. Should your employees include those who are obese or who suffer from a cardiac disorder, you must weight your recommendations accordingly since a HSI of considerably less than 100 will be tolerated.

Most industrial heat exposures do not last for the full working day. The employee will often retire to cooler areas away from the heat source. These areas are termed the recovery environment. There are obvious advantages to subjecting the recovery environment to the same type of heat analysis employed for the work site. In such a relatively cool area, E_{max} will exceed E_{req}. The difference represents the cooling capacity of the environment so that

$$\frac{250}{E_{max}-E_{req}}$$

will be the hours required for body temperature to return to normal after undergoing a 2° rise.

Table I illustrates the application of the method proposed by Haines, Belding and Hatch to analyze an actual work situation. The operations studied involved the several phases of a metal smelting process.

To compile Table I, the heat loads imposed by metabolism, radiation and convection were first determined by measuring the environmental parameters in the recovery area and at each exposure site. Next, E_{req} and E_{max} and the heat strain index for each operation were determined.

TABLE I.
CALCULATION OF AN OVER-ALL HEAT STRAIN INDEX FOR A PARTICULAR AREA

Operation	(A) Hours Per Day Spent at Task	(B)* Metabolic Heat Load M	(C) Radiant Heat Load R	(D) Convective Heat Load C	(E) E_{req}	(F) E_{max}	(G) Heat Strain Index	(A x G) Weighted HSI	(H) Max. Allowable Exposure (hours)	(I) Recovery Time Ratio	(A x I) Recovery Time Required to Reach Normal Body Temp. (hours)
1. Pouring from casting furnace.	0.75	1160	2800	300	4260	1680	254	190	0.10	1.6	1.2
2. Pouring from remelt furnace.	0.75	1160	2800	—130	3830	1600	239	179	0.11	1.5	1.1
3. Skimming slag.	0.25	1160	400	—100	1460	1380	106	26	3.12	0.5	0.1
4. On platform by remelt furnace.	1.00	1400	1220	0	2620	1475	178	178	0.22	0.7	0.7
5. Adding metal to casting furnace.	0.50	1400	0	—150	1250	1280	98	49	no limit	—	—
6. General area (heavy work).	1.00	1400	380	—150	1630	2430	68	68	no limit	—	—
7. Recovery environment.	(3.75)	560	380	—150	790	2430	(33)	(124)	no limit	—	—
					HOURS OF RECOVERY TIME SPENT COOLING OFF = 3.10						
8. Reevaluation of strain of recovery environment.	3.10	Hours spent cooling off					100	310			
9.	0.65	Hours of actual rest					33	21			
	8.00						8	1021			
								128 = Weighted Job Index			

*Columns B through F are expressed in B.T.U.'s per hour.

In the first five operations E_{max} was the limiting factor so that HSI=100 E_{req}/E_{max}. In the following two operations the body's sweating capacity became limiting and HSI=100 $E_{req}/2400$. Next the Heat Strain Index for each task was weighted by the exposure time.

The maximum allowable exposure time was determined from the ratio $250/(E_{req}-E_{max})$.

The Recovery Time Ratio is defined as being:

$$\frac{\text{Time in hours required to dissipate 250 B.T.U.'s in Recovery Area.}}{\text{Time in hours required to accumulate 250 B.T.U.'s at Exposure Site.}}$$

This ratio actually shows the number of hours which must be spent cooling off in the recovery area for each hour spent in the exposure area. A man spending his eight hour day performing the tasks described in Table I would be in a recovery environment for 3.75 hours; however, for 3.10 hours his temperature would theoretically be above normal and his sweating mechanism would be working at full capacity, leaving only 0.65 hours of true rest. Thus, to determine the weighted index for his time in the recovery area, an index of 100 was assigned for 3.10 hours while the remaining 0.65 hours was given the index of 33.

The weighted job index is 128 and describes the entire series of tasks encountered at this particular work site, and would appear to indicate a severe heat exposure. The exact physiological significance of such a high index number merits further study.

Conclusion

In examining this essentially engineering approach to a physiological problem, one natually wonders how well theory agrees with fact. Does it apply to the nonaverage industrial worker who does not trek about the plant seminude?

Turner[4] in Britain has reported that this theoretical approach works best where it is most needed — in hot areas where E_{req} is about 2,000 B.T.U.'s/hr. Less agreement was found in cooler areas, which Turner believes may result from underestimating the metabolic heat load. He found that the mean value of observed heat loss by sweating was only 8.5% in excess of the predicted rate.

Further work appears necessary to determine the physiological significance of index values above 100 and to correlate E_{max} and E_{req} with such physiological responses as body temperature and pulse rate. However, this approach to heat analysis appears highly useful and workable at its present stage of development. The technique of separating the total heat load into its components furnishes a guide for engineering excess heat out of the work environment.

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Legislation for Radiation

Occupational injuries and diseases caused by radiation can and should be covered by the employer-financed state workmen's compensation laws, the National Association of Manufacturers said at congressional hearings on this problem.

Increased industrial uses of sources of radiation, the NAM said, have emphasized the need for a continuing review of workmen's compensation laws to assure their adequacy. Although attention should be given by the nuclear industry to workmen's compensation, the NAM said the providing of benefits for radiation-induced injuries and diseases should be handled no differently from claims arising from other causes.

In order to insure adequate protection of persons and property from hazards in any nuclear energy program, the NAM urged that there be only one set of basic radiation exposure standards. The association suggested that such standards be developed by a recognized national body, such as the American Standards Association.

Using these standards as a technical basis, regulations should then be adopted and administered by the individual states to the extent that their activities in the nuclear field warrant, the NAM said. This procedure will reserve to the states their historical responsibilities in the area of industrial health and safety and will provide coordinated safety standards.

The human organism is not passive to its thermal demands. Certain functions must constantly be performed to maintain its own approximately constant deep body temperature, and a serious strain develops when the body is unable to dissipate excessive heat.

The Physiological

EFFECTS OF HEAT

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The human body is endowed with remarkable adaptability to wide fluctuations in environmental temperature. I cannot hope to cover in detail all of these mechanisms and their interrelationships, but will briefly discuss the more important factors in the physiology of heat regulation and only mention in passing the physical principles of heat transfer.

These physiological mechanisms are so oriented as to make as full use of the physics of heat transfer as possible, and are so flexible that they can operate quite efficiently within a fairly wide range of environmental temperature change without placing serious stress upon the human organism.

The body makes use of a highly complicated mechanism involving physical, chemical and neurological factors to maintain optimum heat balance. Under conditions of comfort, this balance can be expressed as $M \pm S - E \pm R \pm C = O$, where

M = metabolism (always positive)
S = storage
E = evaporation (always negative)
R = radiation
C = convection

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The body, for purposes of temperature determination, can be divided into two regions — the deep, composed of the cranial, thoracic and abdominal cavities, with their contents and a part of the muscle mass; and the peripheral, which includes the skin and subcutaneous tissue and the remainder of the muscle mass. About one-half of the human body lies within one inch of the surrounding air. The deep temperature is nearly uniform, varying only about 1° C at rest; the peripheral temperature is widely variable, over a range of 10° C. Oral temperature is a mixture of the two. Even when the body is at rest, there is a temperature gradient between the deep and peripheral zones. It is this deep, or core, temperature that is the most critical and upon which the maintenance of normal metabolic function is in part dependent. The heat regulatory mechanisms are all directed toward maintaining the relative constancy of this core temperature.

Under normal conditions, heat production (metabolism) is balanced by the loss of heat to the environment, and is maintained without sweating and with optimum skin and deep body temperatures. An increase in the production of heat by muscular work must be balanced by an increase in the rate of heat loss through

sweating and evaporation. In environments above skin temperature, the body gains heat through radiation and convection. This increase in heat load, together with heat from metabolism, must be eliminated by the only remaining avenue, evaporation. Large amounts of heat can thus be dissipated owing to the flexibility of the sweating mechanism. The limit of evaporation is reached when the body surface becomes fully wetted; and if the heat load exceeds the maximum evaporation capacity, the body heat rises. Let us consider what happens when the deep body temperature begins to rise as a result of the above factors. Heat loss depends essentially upon the reactions of the autonomic nervous system. These reactions cause important changes in the blood vascular system.

First, in the redistribution of blood by the dilatation of the vessels of the skin, blood is diverted from the internal regions to the external surfaces, thereby increasing heat loss.

The second factor is an increase in blood volume, brought about by dilution with fluid drawn into the circulation from the tissues (chiefly the skin, muscles and liver), and by blood from the spleen. These changes in blood volume are of paramount importance in temperature regulation.

The third factor is an increase in the circulation rate. Cardiac output is increased if the environmental temperature exceeds 30° C. Minute volume is increased by 5% to 30%, chiefly by an increase in heart rate. The blood-vascular changes are initiated by:

1. A rise in the temperature of the blood supplying the nervous centers in the region of the hypothalamus.
2. Reflex through centers in the brain and spinal cord in response to changes in skin temperature.
3. Local axon reflexes.
4. Responses of the vessels of the skin to direct stimulation by changes in the external temperature.

The anatomical arrangement of the vessels of the skin is an aid to heat regulation, for the arteries first pierce the muscular layers before reaching the skin, and so pick up muscle heat and bring it to the surface. On exposure to heat, and in muscular exercise, most of the blood that has passed through the cutaneous arterioles, capillaries and arteriovenous anastomoses returns again to the surface through dilated superficial veins where it continues to be cooled. Vasomotor responses are greatest in the extremities, which are the most effective areas of heat dissipation. Blood flow through a finger can change through a range of 0.5 ml to 90 ml/min/100 ml of tissue, through a hand from one ml to 220 ml.[1]

The body is equipped with two types of sweat glands — the large apocrine glands of the axillary and pubic areas, which play no significant part in heat regulatory sweating; and the smaller, numerous, widely distributed eccrine glands. It is these eccrine glands, whose secretory action is widely variable, that play the primary role in the production of sweat. Eccrine sweat is dilute, hypotonic, and contains sodium, chloride and small quantities of other body metabolites. The average man has about 2,500,000 of these sweat glands, whose secretory action depends chiefly upon changes in skin and blood temperature, and usually occurs when the skin temperature goes over 94° F, or when blood temperature goes up 1.0° F. In muscular exercise, sweating may be initiated by the motor cortex of the brain before the deep temperature actually rises. Sweating cools only inasmuch as it evaporates; evaporation is enhanced by air movement and the removal of clothing. The efficiency of evaporation depends upon the relative humidity, and at elevated environmental temperatures this may be the limiting factor.

Not the least important in the body's temperature regulation is chemical control. This control is effected by changes in the amount of combustion going on in the tissues. The percentages of total metabolic heat generated in different parts of the body are accurately reflected in the total oxygen used by those regions.

Under basal conditions, the internal organs (liver, spleen, kidneys, intestines, brain and myocardium) which together compose 7.3% of the body weight, account for 57.6% of the total oxygen consumption. This resting activity is in contrast to that of the skeletal muscles which make up 50% of body weight but use only 20% of the total oxygen consumed. This distribution changes radically during muscular exercise. In moderate exercise, the total heat production rises to three times the basal level and 70-80% of it is generated in the peripheral muscles.

Heat is also produced by the specific dynamic action of foodstuffs. In winter there is a tendency to ingest more protein foods, for protein has the highest SDA. In summer the reverse is true, and persons living in the tropics consume less protein foods in general.

The metabolic rate is influenced by certain of the glands of internal secretion. The thyroid gland exerts the greatest direct action upon heat production. Thyroid activity is not subject to rapid changes and so probably has little to do with the quick alterations in heat production which characterize most of the responses to environmental heat or cold. Its activity is directed toward the basal rate of the tissue combustion and may be of some importance in slowly de-

veloping adaptations. The thyroid activity is under the influence of the anterior lobe of the pituitary and its thyrotropic hormone. Direct nervous control of the thyroid is probably of no great significance in temperature regulation.

The activity of the adrenal medulla is known to be rapid and induced by nervous control. Epinephrine, its secreted hormone, has a known calorigenic action in the body and probably does play an active part in the processes of temperature control.

As we have pointed out before, when the body temperature continues to rise in spite of its efforts to dissipate the heat, a condition of serious strain develops. There are workable formulae which can be applied to a given environment to determine, often in advance, how much heat strain will be imposed upon the worker. One of these is the formula devised by Belding and Hatch[2] by which the heat stress index is calculated. This Stress Index is arrived at by calculating the E req (the evaporative heat loss required for thermal balance [M + R + C]) and E max (maximum exaporative capacity) and utilizing the formula E req/E max × 100 = Stress Index. A Stress Index of 100 is that which represents the maximum strain tolerated daily by fit, acclimatized young men.

Hatch[3] has summarized the effects of the various indices of heat strain, and I will briefly point out the medical and physiological implications.

In mild to moderate heat strain, with an index of 10-30, the important factor is the screening of the borderline individual who has some cardiovascular limitation, and whose ability to perform muscular work at the level of zero heat strain is marginal.

In severe heat strain, with an index of 40-60, it is necessary that the workmen be physically fit and acclimatized. Medical selection should be carefully carried out, and persons with cardiovascular or respiratory impairment or with chronic dermatitis should be excluded. The first because of their inability to transfer heat from deep tissues to the skin rapidly enough to dissipate this heat; the second because of their inability to provide sufficient oxygen to the tissues to meet the elevated metabolic requirement; the last because the sweat glands are "knocked out" by the extensive, chronic dermatitis and the ability to sweat is seriously impaired. The psychological reaction to heat is an especially important factor here.

In very severe heat strain, with an index of 70-90, the important factors are, first, the selection of fit personnel who, after acclimatization, have proved that they can withstand the hot environment; and second, the prompt removal of temporarily indisposed persons from the hot atmosphere until there is complete recovery from their illness. In these workers, the psychological reaction to heat is of paramount importance. Adequate salt and fluid intake is imperative.

Acclimatization is a necessary factor in man's ability to withstand heat strain. It is characterized by the ability to work with less rise in pulse, less rise in deep body temperature and secretion of less (but a more dilute) sweat, with a resulting conservation of sodium and chloride. Acclimatization to heat occurs in from one to two weeks. In this period, the urine sodium chloride is lowered, and is conserved by the kidney in excess of that lost in the sweat. An acclimatized man can lose 5% of his body water before cardiovascular problems lower his efficiency. An unacclimatized man has lowered efficiency even before dehydration occurs. Renal conservation of NaCl seems to be the real key to acclimatization. Acclimatization is caused, at least in part, by an increase of adrenocortical activity and manifested by increased blood volume, better vasomotor control and more efficient sweating, with a very low electrolyte content.

An interesting observation in this mechanism of acclimatization was made by David B. Dill[4] in his studies on workmen during the building of Boulder Dam. In the adaptation to the high, dry heat of the area, he observed that the urinary output was markedly reduced during the first few days or weeks in the desert. One man passed no urine at all for the first three days on the job.

Unfortunately, man, unlike the horse and ox, does not crave salt, even when it is badly needed. If the sweat glands continue to excrete a larger quantity of salt than is ingested, thirst and renal activity are adjusted so that the extracellular water of tissues is reduced; and, for the time being, normal osmotic pressure is maintained in the tissues. If salt and water depletion continues, and if the subject is doing hard work, fatigue, cramps or heat exhaustion may ensue. These reactions generally occur in exposure to dry heat which allows for ample cooling by evaporation of sweat and when the loss of salt and fluid is not replenished.

Heat exhaustion results from physical exertion in a hot enviroment when vasomotor control and cardiac output are inadequate to meet the needs of increased skin circulation, in addition to muscle and cerebral circulation. It can occur to even the most fit man if the work is heavy enough or the environment is severe enough. It is a nonfatal physiologic disturbance, unless complicated by a coexisting disease. Obviously,

even a minor degree of dehydration will prevent maximum cardiovascular adaptation and so predispose to heat exhaustion. Salt deficiency from any of several causes predisposes to heat exhaustion. Symptoms of faintness with a subjective sense of palpitation are predominant. Nausea, vomiting, syncope, headache and restlessness are common.

Heat cramps are painful contractions of skeletal muscles; usually seen in manual workers in hot environments whose body fluids have been depleted of sodium chloride, by unreplaced heavy losses (up to 20 gm a day) in sweat, the actual mechanism of cramp causation remains poorly explained.

When one does not sweat enough or when the environment is too humid or clothes too impervious, one may get heat stroke or prostration. Heat stroke is a failure of adequate heat elimination almost always related to a breakdown of the sweating mechanism; it may occur whenever heat regulation is dependent on sweating for long periods of time. Experimentally, the rate of sweating in normal individuals has been found to decrease progressively during work in the heat and finally lead toward a real deficiency of sweating. In heat stroke, this process has apparently gone on to complete breakdown of the temperature regulatory mechanism, to complete cessation of sweating and extreme elevation of body temperature. The primary damage is edema of the central nervous system and may even result in destruction of the nerve cells in areas of the cerebral cortex.

Heat stroke rarely occurs if relief from sweating is afforded during part of the day; such as in desert areas with cool nights, or where air-conditioned sleeping quarters are available. It is interesting to note that Dill[4] records that during the first year of the building of Boulder Dam there were 15 deaths from heat stroke and innumerable cases of cramps and exhaustion. The men slept in quarters near the dam. Shade temperatures during the day were as high as 53° C (127.5° F) and temperatures at night often remained above 38° C (100° F) until after midnight, and sweating was almost continuous. The second year, the barracks were air-conditioned and moved to the plateau near Boulder City. There were no deaths from heat and only five cases of cramps.

We have talked about physical and physiological reactions to heat. There is another important reaction — the psychological, or I suppose one might term it, psychophysiological, since the physiological response can be influenced by psychological reaction. Extremes of heat and humidity affect the worker psychologically in two ways.

1. Marked emotional states (anger, fear, jealousy, etc.) are known to increase body temperature and general bodily discomfort, giving rise to flushing, etc. We speak of a "heated discussion" and of being "hot under the collar."

2. Attitudes of resentment and antagonism tend to lower the threshold of perception of heat and so increase the susceptibility of the worker to its harmful effects. A "difficult" foreman or an "impossible" first sergeant often sets the stage for increased incidence of heat exhaustion, heat stroke and other untoward reactions.

The individual's physical reaction to heat is seriously affected by his attitude and personality. His discomfort may be affected more by how he feels about the heat than by the actual temperature. Therefore, the way he feels is affected both by the emotional and physical atmosphere in which he works. Even animals exhibit increased irritability in hot weather and we have the term "dog days" for that hot, humid period of the year.

The increased irritability and belligerence, decrease in morale and spirit of cooperation, increased sense of fatigue, increased anxiety and apprehension and the inability to concentrate may lead to such serious problems to industry as accident proneness, unnecessary time off, work spoilage, labor turnover, low productivity, lowered quality of production and low morale.

Summary

Upon the constancy of the deep body temperature depends the health and comfort of the individual. The process of heat generation (metabolism) is chemical, and that of heat loss is physical; the complex physiological thermoregulatory mechanisms are directed toward maintaining the optimum balance between the two.

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GM

Industrial Hygiene Service

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Healthy, satisfied employees represent one of industry's strongest assets — often more valuable than the most complex machine. But man, too, is a complex mechanism of limited durability who will fail or falter when subjected to chemical or physical stresses beyond his capacities.

Recognizing these human limitations and the need for conserving health, progressive managements have established programs to protect employees from undue stress and industrial disease. One phase of such programs is Industrial Hygiene — the science and art of preserving health through the recognition, evaluation and control of environmental sources and causes of illness in industry.

Service Available

General Motors was one of the first to establish an Industrial Hygiene Department with responsibility for directing a field service and providing consultation on related matters to all divisions. The experience of this department has been extensive and diversified, and is available to any division with environmental problems.

Study of Environmental Conditions to Insure Healthful Work Places

Each year new chemicals are introduced into industry. These frequently have toxic properties and, if inadequately controlled, can produce conditions that may interfere with the health and well-being of the employee.

Evaluate Exposures

Members of the Industrial Hygiene Department evaluate exposures arising from these compounds by surveys of the working environment. Upon request, or during routine visits to each plant of the Corporation, major attention is given to the study of exposures to such substances as chromates, acid and alkali mists at plating operations; silica dust in foundries or at sand blast operations; cadmium, zinc or iron fumes associated with welding operations; lead fumes and dust from soldering, body finishing or bearing manufacturing; solvent vapor from painting or cleaning activities; and nuisance dust exposures from grinding on nontoxic metals, such as steel or cast iron.

In addition to long recognized exposures, studies are also made of the newer metals, chemicals and diversified materials now being used in manufacturing processes. These include studies of the possibility of environmental contamination from beryllium, the epoxy resins, the isocyanates, the naturally radioactive metals or compounds of uranium and thorium as well as man-made radioisotopes.

Evaluation of Exposures Necessary for Adequate Control

After recognizing the existence of a potential exposure, the degree of contamination must be determined. When possible, direct-reading instruments are employed in plant surveys. These devices permit study of variations in the environmental levels of contamination at the site of the operation. Frequently, however, instrumentation of this type is not available, necessitating the removal of a sample of the contaminant from the air, for subsequent analysis in the laboratory, an essential part of the Department's activity.

Laboratory analyses include microtechniques for quantitatively determining concentrations of dusts, gases and mists including toxic metals and compounds, solvents and other organic compounds. When dust concentrations are of con-

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cern, count and particle size distribution are accomplished by microscopic methods. In addition, when investigations require the use of an electron microscope, infrared analyzer, x-ray diffraction equipment or other highly specialized instrumentation, these facilities are available.

The laboratory of the Industrial Hygiene Department also provides a service to the Corporation's medical directors in analyzing biological samples to determine early absorption in advance of ill effects. Most notable in this respect is the blood-lead program. More than a decade of experience has verified that analytical findings of lead in blood are reliable indices of the degree of lead exposure and absorption. Annually, approximately 10,000 blood specimens from U. S. and overseas employees are examined for lead. The information obtained by this technique serves as a continuing survey of environmental conditions and, more significantly, provides laboratory data to be used by the plant physician in evaluating employee health.

The use of biological specimens is also applicable to other exposures including benzene, mercury, natural and man-made radioactive isotopes and to a limited extent beryllium.

Ventilation as a Control Measure for Good Working Conditions

As another phase of the service provided, the industrial hygienist offers suggestions to management for controlling significant exposures. This is a matter for joint effort. Depending on the circumstances, professional personnel concerned with this phase of environmental improvement would include process, layout and plant engineers. From practical experience, the hygienist approaches the problem with preservation of employee health as the ultimate goal and is able to advise on pitfalls to be avoided. By cooperative effort, the most practical and economically feasible control measures generally result.

A satisfactory industrial environment is to a large degree dependent upon ventilation. Comments reaching the Industrial Hygiene Department are frequently related to lack of air motion, of one's being too hot or too cold or to the existence of nuisance conditions created by low levels of oil mist, smoke or dust. By the proper application of both exhaust ventilation and air-supply systems, these conditions can be materially improved and the maximum benefit obtained from equipment provided. Basic factors, including the location of air-supply and heating units coupled with the recognition that the cooling rate of the human body must be controlled, are frequently overlooked in designs for improving an existing condition and layouts of ventilation for new building construction. The Industrial Hygiene Department approaches problems with these factors in mind. More effective use of air motion, at reduced cost, has resulted.

Reduction of Physical Stresses is Fundamental to Employee Health

While environmental exposures to chemical hazards have long been of vital concern, the effects on industrial employees of physical stresses, such as radiant heat, noise and ionizing radiation have received more recent emphasis.

It is well known that high temperatures, excessive noise and exposure to intense ionizing radiation may result in physical damage. As the intensity of these physical stresses decreases, the symptoms become vague, ill defined, and suggestive of psychosomatic conditions. Since clinical symptoms may not substantiate the employees' opinions, helpful information to assist in evaluation can be obtained by surveying the area of concern. Studies of this nature fall within the Industrial Hygiene Department's responsibility.

Radiant Heat Can Be Controlled

The human body is equipped to effect its own heat balance through a wide range of environmental conditions. When the compensating ability of the human body is exceeded, the resultant stress causes a reduction in physical activity with loss in production and possible impairment of health. When conditions of this type develop, or when excessive heat due to plant processes develops during the summer, assistance is often requested of the Department in the establishment of corrective engineering measures.

Effective control is dependent upon an understanding of the properties and characteristics of radiant heat as well as convected and conducted heat. In addition, the benefits to be gained by the application of ventilation and/or reflective shielding must be understood. Through consultation with divisional management, "hot spots" have been cooled to the extent that production continued where work stoppages threatened. A survey of the plant will reveal areas where these principles may be beneficially applied.

Noise Control Program is Essential

Like radiant heat, excessive noise is a major concern. This concern centers on the hearing loss of employees that develops gradually due to exposure to steady or intermittent noises that are related to the operation being performed.

Sensory perception of the levels of noise intensity is not reliable and more scientific evalua-

tion must be employed. Consequently, as with chemical contaminants, a survey, including analysis of the frequency or pitch of the noise, should be made in the plant. Such a survey provides management with basic data regarding their noise exposures and the potentials for producing hearing loss. The information obtained from such a study will also serve to indicate the need for and magnitude of a plant noise control program.

The plant survey should also include analysis of background noise levels prevalent in the existing or proposed areas used for audiometric testing. Survey data of this type will indicate the need for acoustical treatment of the area or, if recognized standards have been met, will substantiate the audiometric findings.

Since control of noise can be difficult and costly, a long-range program should be seriously considered. Such consideration should include plant layout, methods of operation and the inherent noise levels of tools and equipment. Naturally, emphasis should be placed on the selection of tools that are intrinsically quieter. Noisy operations should be segregated or isolated from relatively quiet areas of the plant. By initiating these basic approaches in their control programs, some of the divisions have successfully corrected serious noise problems.

Industrial Hygiene personnel have worked closely with the divisions in the control of noise sources. As with ventilation and radiant heat, basic engineering details must be incorporated in the design to accomplish the desired result; failure to do so results in costly installations of little or no sound attenuating value. The Industrial Hygiene Department invites the opportunity to review plans for noise control installations in the planning stage to assist the divisions in avoiding these pitfalls.

Fringe activities concerning noise include the study and consultative services made available to the divisions in evaluating and controlling conditions that are responsible for speech interference and neighborhood complaints.

Ionizing Radiation Exposures Should Be Minimized

With expansion in the field of nuclear energy and its associated introduction of radioactive by-products into industry, care must be exercized to protect industrial employees from ionizing radiations. A continuation of the expanded use of radiation sources may be anticipated since the use of isotopes in manufacturing processes and as research tools is inevitable.

Ionizing radiation conditions encountered most frequently within General Motors are those associated with the use of industrial and medical x-ray units. More recently there has been a significant increase in the number of sealed sources containing natural radium or isotopes such as Cesium 137, Cobalt 60 and Strontium 90. The expansion of radiochemistry has caused the introduction of radioactive solutions, powders and irradiated materials. High energy power packs, such as those used in conjunction with electrostatic spray installations, are also capable of producing ionizing radiations. All of these materials and or equipment can be used without harm to the employee provided adequate safeguards and protective measures are employed.

Radiation Protection

Establishment of adequate radiation protection involves problems of building construction, proper operating procedures and periodic monitoring of personnel and equipment. The Industrial Hygiene Department has been charged with reviewing, at the design stage, the protective features of new installations to insure adequate protection of the employee. In reviewing designs, the philosophy advocated by geneticists is followed, namely — avoid any unnecessary exposure to ionizing radiation.

Many states now have codes requiring registration of radiation sources. In some instances these codes require that radiation surveys be performed to insure compliance with the law. Members of the Industrial Hygiene Department are available to perform these surveys and advise on the adequacy of protective measures in relation to existing or proposed uses of sources of ionizing radiation.

By Study of Stack Effluents — Industry Saves Money and Remains a Good Neighbor

Knowledge that the industrial hygienist has attained in his studies of plant environment can be projected beneficially into other fields. These fringe activities are not directly related to the health of the industrial employee but pertain to matters of public and community relations.

Atmospheric pollution resulting from the discharge of nuisance or toxic contaminants in stack effluents is a matter of concern for industry. This concern arises from property damage, both on and off plant property, and neighborhood complaints of soiling and odors allegedly from Corporation sources. Concern may be due to excess roof loadings from accumulations of material or the re-entry of objectionable contaminants into the plant.

Out of the general problem of air pollution investigations undertaken by the Industrial Hygiene Department has arisen a service of evaluating gas and air cleaners which has specific economic interest to plant engineers. These stack emission tests are undertaken, at the re-

quest of the divisions, to determine the total loadings of contamination being discharged and the operating efficiency of specific air cleaners. These data can be compared to established codes or other limits of permissibility that may be available. The data may also be used to compare air cleaner performance with design data under actual operating conditions. Information gained assists in the intelligent selection of additional or replacement equipment.

Consultation — In Advance of Difficulty

Consultation on matters related to or associated with environmental problems is a major facet of the Industrial Hygiene Department's activity. The consideration of health is important in the planning stages of new processes and building construction. Not only should research, development, and construction engineers center their attention on mechanical or structural aspects of the project but they should also consider, as a routine matter, effects on the employee who must perform the operation and occupy the space. It has been the practice of some divisions to consult with the Department when new processes and materials, involving toxic constituents or materials of unknown toxicity, are being introduced. This should be standard procedure for all divisions. It enables them to utilize the experience of the Industrial Hygiene group for building into the process necessary requirements for health protection and thus avoid costly and frequently unsatisfactory modifications performed after difficulty is encountered. Experience with air-supply systems for comfort cooling and x-ray installations are two cases in point.

The Department is also interested in studies performed by state agencies in the Corporation plants. When possible to make the necessary arrangements, it is preferable for a member of the staff to be present during such studies. Experience has indicated that when this procedure is followed, the operating test conditions and related opinions are more realistic and scientifically accurate.

Recognizing the trend toward legislation, and the impact of poor laws on industry, it is the policy of the Department to be alert to legal developments in the field of industrial hygiene. Its members have cooperated with sponsoring agencies, trade associations and divisional personnel in reviewing the technical aspects of proposed legislation. Information relating to new legal developments within this area of interest would be welcome.

Gum Arabic as an Allergen

The allergy of printers to gum arabic is a genuine and undoubtedly severe occupational disease. Examination of workers in a Paris printing works where gum arabic is widely used reveals that this substance provokes a relatively high incidence of severe allergic manifestations. One hundred five persons exposed to gum arabic were examined.

Sixty-nine percent of the workers who had to do with black or color printing, as well as 53% of the offset specialists, suffered from allergic manifestations. The most common of these were rhinitis and coryza (68%), while 52% had asthma, 52% conjunctivitis and 31% pruritus. In some instances, the allergic manifestations became noticeable in the very first year of exposure, but as a rule they occurred between the second and tenth year of employment. The first phenomena to appear were usually rhinitis and conjunctivitis, followed by asthma after the lapse of a few months or years. The asthma caused by gum arabic was intermittent to begin with and was dependent on the worker being present in the printing shop. Later on, the asthma became permanent and very severe.

Allergological studies with skin tests showed that the allergy was seldom confined to gum arabic, but generally extended to other types of gum. Treatment consisted in removing the noxious agent. Specific desensitization proved pointless.

The most common occupational disability, pain in the low back and pain referred from this region, is only a symptom and in no way a diagnosis.

There are many defects that definitely contribute to instability of the lumbar and lumbosacral regions which, under stress and strain, are the underlying causes of low back pain. However, not all of the numerous deviations from normal, as detected by x-rays, need disqualify a man from holding a job.

THE OCCUPATIONAL

LOW BACK HAZARD

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Pain in the low back and pain referred from this region is the most common occupational disability. There are many causes of such symptoms. The foremost problem in handling these cases is to make a correct diagnosis and to remember that low back pain and referred pain are only symptoms and not in any way a diagnosis.

More precise diagnoses of the underlying causes for back complaints is indicated in this branch of occupational medicine. The low-back problem is difficult and confusing whether one approaches it from the standpoint of local or referred pain. In industry one encounters emotional problems in the subject which further complicates this picture.

Rose[1] states; "It is now some 20 years since Mixter and Bar 'discovered' the intervertebral disc. Since that time its popularity has grown, at first slowly but with gathering impetus, until it is now probably at the pinnacle of its fame and therefore qualifies to be included in the limited group of subjects considered suitable material for music-hall jokes. Psychologists, of course, have long pointed a warning finger at the hidden significance of jokes, but all that an orthopedic surgeon can deduce from this phenomenon is, that the term 'the disc' has now reached a stage of universal misunderstanding."

As a radiologist with many years of experience performing thousands of pre-employment x-ray examinations of "low backs" and testifying in workmen's compensation courts, the writer, aside from intensive study, has had to develop a certain amount of humor, satire and philosophy about the whole low back problem. No two backs are alike; not even in twins. Here, labor sits on one side, industry on the other, the insurance companies and a few politicians in the middle, with the petitioner on the "hot-seat." All must win the case and all try to do so depending upon the circumstances. The patient says he

has pain. It is from that point that a chain reaction can begin, no matter whether he eventually winds up in a psychopathic ward.

Russek[2] writes; "The compensable back injury is a special problem and differs from all other industrial injuries in costs and time lost."

Nicholson[3] impatiently states (and with just cause), "The care of the compensation patient by the physician, presents a series of events that may result in an uncooperative patient, prolonged patient disability, an unpleasant association for hospital personnel, an unappreciative employer and a dissatisfied insurance company."

Says Krusen[4], "The compensable back injury is so common and its implications are so far reaching that there is need for further intensive investigation and study of this serious problem." He goes on to say, "Engaging a lawyer often seriously retards the patient's recovery. The employer should make every effort to provide prompt accurate diagnosis and early adequate conservative treatment. The insurance company should maintain a cooperative attitude toward the patient's treatment program. Litigation should be avoided if at all possible." Krusen then gives an analysis of his treatment of 509 such cases by conservative means: "Fifty-four percent were eligible for compensation and 46 percent were not. Eighty-eight percent of the latter improved with treatment compared to 55.8% of the former. Those with compensation received more treatments. Women expecting compensation showed the worst response to treatment while receiving the greatest number of treatments. Apparently many of them resent the fact that they are required to hold a job, and there seems to be no motive for the women with compensable back injuries to return to work. On the other hand, the women with noncompensable back injuries showed more improvement than the men, perhaps because there was less undesirable pressure on them after recovery."

Gordon[7] writes, "The chronically disabled victim of persistent low back pain following an industrial injury shares the vexations of his difficulties with the physician and the insurance company. The patient languishes physically, economically and morally, while either pursuing treatment in the hope of eliminating his pain or anxiously awaiting settlement. The physician searches to discover some organic, treatable cause for the tenacious symptoms. The carrier has his legal and financial responsibilities, but often is immobilized from taking an active part in the management of the case."

The battle, since the "discovery" of the disc, has been raging among surgeons all the way from emergency disc surgery to no surgery at all or "fusion" after disc surgery to "no fusion" at all. Surgeons have discovered that the results of surgery in the self-employed are much more successful than in the company-employed. The successful results of surgery may be implied from the National Safety Council release of October, 1955, as it gave a year's experience of the Commonwealth of Pennsylvania with some 6,900 back injuries reported, amounting to $1,500,000.00 in compensation payments. Many believe that there is too much surgery being performed on the low back.

At a clinic on "Psychosomatic Problems," sponsored by the Harvard teaching of Psychiatric Services at the Massachusetts General Hospital,[6] there was presented the story of an intelligent young engineer-contractor who lifted a plank on his contract job and thereafter went through all sorts of disc hell, from drug addiction, to confinement in a psychiatric ward and recovery, to going south with his family and successfully re-establishing his life and his business. He refused operation during the entire course of his illness.

The impact of Goldthwait and Osgood's[7] paper on subluxations and strains of the sacroiliac joints still persists in medical teaching or thought among the graduates in medicine of former years. Since then, the difference between sacroiliac and lumbar and lumbosacral difficulties had indeed been carefully analyzed but, even today, many physicians and or laymen still think in terms of the "sacroiliac." In truth, a sacroiliac disease diagnosis rarely can be made as compared to the real cause of most lumbar and lumbosacral distress. Radiologists, for years, practically stood on their heads trying to demonstrate so called sacroiliac dislocations and/or subluxations as the cause for low back pain and pain down one or both legs. Finally, they gave it up in disgust because, as physicians, they could not correlate the roentgenological findings with the clinical and pathological findings attested to by such as Goldthwait and Osgood. However, the latter, at least, did attract attention to the general "hind-end" low back area as an underlying cause for so called sciatica, cricks, lumbago, sacroiliac and local and/or referred pain.

Insurance companies, industry, legislators for workmen's compensation laws, the legal profession, the medical profession, labor, and those educators interested in the social, moral and economic problems of health involved are concerned about the low back problem. Some quote Mark Twain, who said, "Everybody talks about the weather, but nobody seems to be able to do much about it."

The mass of medical literature that has ap-

peared the world over in the discussion of the low back problem is appalling because there are so many different ideas about solving the problem. Various cults have arisen because of it, even to going back to the electric belts of the old quack days.

McDonald[8] discovered in the General Electric plant at Schenectady, N. Y., that of all claims three years old, back cases caused from 30% to 40% of total expenses paid. (It is much higher elsewhere.) This included benefits to patients, apparatus used in treatment, medical expense and awards for permanent injury. After three years this climbed to 60% and at 10 years climbed to higher levels, aided by awards for permanent injury from permanent, partial to total disability. So it was decided in 1955 that at this plant there should be lumbar and lumbosacral pre-employment x-ray examinations. It was an economic move, following a then recent so-called second injury law, which ruled that prior knowledge of a permanent physical impairment of any sort limits the employer's compensation liability to 104 weeks for a subsequent injury; after which time the employer is reimbursed by a "Special Disability Fund." It was decided that conservative standards would be set up in the examination of the x-ray films of each case, and the x-ray examination was thorough. Instead of rejecting cases which were abnormal, certain limitations were imposed which the company felt were sufficiently normal to protect them should injury arise later. It was the company's policy to employ the handicapped rather than to condemn a man to a substandard existence. In the analysis of 9336 individuals examined, there was included spines of all those showing moderate degrees of scoliosis and lordosis as acceptable, but almost all abnormals were accepted. In all of these three categories there was a total of 4,779 or 50.3% of the 9,336 x-rayed as normals. The rest were found to be abnormal. This was startling, but sufficient information was gained for protection of the company under the new law in case of future injury, or to controvert claims with little basis in fact or definitely fraudulent in character.

There is an old saying that, "All statistics mean all things to all people." This can be aptly applied to many of the present statistics that have been presented in connection with the low back problem, except for money spent and man hours lost on the job. In the low back, there are more development anomalies than in any other portion of the body. Statistics, as reported by various people following pre-employment x-ray examinations, vary as to what really contributes or predisposes to a distinctly unstable low back. One such is the report of Runge.[9] In 1951 he had 33.3% of x-ray defects with 5,340 employees in the shop, but during the 1954-56 average, with 2,085 employees in the shop, he found 57.6% with x-ray defects. He concluded that there was no variation between the incidence of back injury in the laborers with x-ray defects and in those without such defects. In his 1954 report of 4,654 pre-employment x-ray studies, he found 25.44% had defects which he felt to be of actual or potential significance.

Colcher and Huroh,[10] railroad surgeons, had various qualified radiologists examine 1,500 applicants. They were correct in concluding that there is no single condition in this country that causes more lost man hours than disability from low back symptoms. In their survey, they concluded that 55% showed no gross abnormalities and 45% presented one or more anatomic-pathologic conditions, most of which caused rejection for employment as unstable backs. There is a difference of opinion about some of the conditions found in their survey being sufficient cause for rejection.

Reiner,[11] in an x-ray pre-employment study of 1,030 candidates, found 59.31% of pathological changes, but 35.81% were accepted for jobs. Oblique views were obtained only when it was thought necessary after single anteroposterior and lateral projections had been viewed.

Diveley and Oglevie,[12] over a 20 year period, studied 3,587 patients complaining of low back pain and disability, and raised the question, "What number of these low back injuries could have been prevented by selective employment or activity?" They had a pre-employment study made of 6,523 prospective employees and found 41.1% of congenital anomalies in the lumbar and lumbosacral regions, with only 39% showing no abnormal architectural weakness or pathological changes demonstrated by the x-ray examination of the lumbar and lumbosacral regions. They too made but single anteroposterior and lateral projections of the lumbosacral regions, except when they thought there was a questionable case, and only then did they obtain oblique views of the lumbosacral region.

Coulter[13] had a radiologist examine 109 back cases and received 27 negative x-ray reports. He concluded that pre-employment x-ray examination was an excellent procedure for excluding some of the back disabilities, but that it would not exclude disc, or prevent fractures of the spine.

It would be pretty difficult to recommend rejection of approximately 50% of the labor population of this country for jobs, but a knowledge of what exists in a man's back found only through pre-employment x-rays is indeed a protection to the company. After someone is

hired, the old films can always be re-examined for a thorough analysis to fit the circumstances of injury that later may take place, and then every tiny variation from the strictly normal back may be defined. However, one of the highly specialized industries in this country has now had to reject 50% of applicants for jobs who show existing anatomical defects in the lumbar and lumbosacral regions. They used to reject about 10%. Add to that the lack of perfect vision, etc., and one must come to the conclusion that physically, at least, this industry picks only the cream of the crop. It takes years to train their men. All the expert training of a man for years can blow up when he develops a "bad back."

It used to cost this industry $5.00 for a medical pre-employment examination. It now costs them much more and they consider it a good investment. Not long ago there was but a single 10 x 12 x-ray film made of the lumbar and lumbosacral regions in the anteroposterior and lateral positions and an inexperienced doctor read the films. There is now obtained 14 x 17 x-ray films of the lumbar and lumbosacral regions in the anteroposterior, lateral, left and right oblique and a spot lateral and spot angled projection made of the lumbosacral articulations. An expert radiologist who has an experienced background understanding of the lumbar and lumbosacral low back problem now interprets the films. He recognizes an unstable lumbar and lumbosacral region that is most likely to give way under stress or strain, no matter whether, at the time of the pre-employment examination, the man possesses symptoms referable to his low back. If we are going to get into the heart of this thing accurately, at least from the x-ray standpoint, more physicians should know about what it takes to perform and interpret an accurate x-ray examination of the lumbar and lumbosacral regions.

Millikan[15] dogmatically states that 90% of symptoms of so called sciatica, local and or referred, are caused by protrusion of the intervertebral disc. Most do not agree. The writer, however, does agree with Compere[16] that, "The face of orthopedic surgery has been changed in the past few years." He speaks of "serendipity" (the gift of finding valuable or agreeable things not sought for) and the good judgment required to recognize the facts and use them in the care of orthopedic patients.

There is much that can be done to shape low back statistics, for instance, in the various age groups. Further investigation is needed of the appalling physical, economic, psychological and moral problems connected with the low back hazard of which qualified physicians must assume a tremendous responsibility.

The 10 x 12 x-ray film examination of the lumbar and lumbosacral regions can cover these areas, but it is not enough, even though the anteroposterior, lateral, left and right obliques, spot lateral and angled projections are obtained of these areas, because certain changes in the lumbar and lumbosacral regions are reflected in the lower dorsal region. Therefore, no x-ray examination of the lumbar and lumbosacral region is complete, from the x-ray standpoint, unless 14 x 17 inch x-ray films are obtained in the anteroposterior, lateral and left and right oblique projections and 10 x 12 spot lateral and angled projections of the lumbosacral articulations. An x-ray technician can be taught to obtain the anteroposterior and lateral projections on a divided 14 x 17 inch x-ray film. The same is true for the left and right oblique projections.

There should be a rubber foam support under the lower lumbar vertebrae in the lateral projection obtained of the lumbar and lumbosacral regions when a small, also routine, 10 x 12 or 8 x 10 inch film is used for a view of the lumbosacral articulations. When the required angled or cephalad projections are obtained of the lumbosacral articulations, judgment must be used according to the degree of the lumbosacral angulation. To save expense, but not time, the radiologist should be shown the lateral lumbosacral angulation degree, before the angled projection of the region is obtained cephalad and under his supervision if the x-ray technician cannot accurately follow directions. But, in the experience of the writer, some technicians who are specially trained in the x-ray examination of these regions do quickly catch on, so that all the radiologist has to say is "angle it at so and so many degrees." There is no standard degree for this angulated projection because almost every man's lumbosacral angle degree varies. Oblique and lateral projections may have to be repeated in the presence of a scoliosis. The explanation for the necessity of obtaining all of the above described technical views in the x-ray examination of the lumbar and lumbosacral regions is quite simple. No matter what projection is obtained on an x-ray film of these areas, there are always seven or eight osseous structures superimposed in a line by the x-rays. To untangle a true analysis of the situation, all full views must be obtained. It is like using a sextant at sea to find out where you are. At times it is necessary to obtain various projections with the candidate standing in an upright position.

If this low back problem is to be properly studied, the x-ray examination must be stand-

ardized accurately and completely. It is expensive, but when one realizes what it may cost a plant to pay for the life-time care of a few completely disabled men with low back trouble, one must realize that that cost can pay for a great many x-ray films and for a good professional to interpret them. The expense and pitfalls of myelography, discography and other x-ray examinations preceding and following operative procedures when a man fails on the job are not within the premise of this paper, but it is necessarily extensive.

In conclusion, the writer, as a radiologist, does not wish to place too much emphasis upon who should read the films made following an x-ray examination of the lumbar and lumbosacral regions. But he does wish to emphasize the necessity for correlating the roentgenological findings with the clinical findings when a man develops real back trouble. This requires experience and sometimes it may require the group experience of the radiologist, orthopedist, neurologist and internist working together who should not read too much or too little into the films. The x-ray examination is of tremendous importance in this low back problem, but there is much "weeding out" of opinions necessary on what is and what is not an unstable low back in the pre-employment examination. The old adage, "We see only what we look for; we recognize only what we know," should be kept in mind. And there should always be accurate application of the five w's: "why, what, where, when and who."

Summary

Thought provoking quotations and impressions have been presented with a hope that they may promote more panel discussions and more extensive investigations.

An attempt has been made to describe the proper method in the x-ray examination of the lumbar and lumbosacral regions; and suggestions have been made in connection with the importance of correlating clinical with roentgenological findings.

Pain in the low back and referred pain are symptoms and not in any way a diagnosis. There are many causes for such pain.

In so far as expense and man-hours lost are concerned, the low back problem is the bugbear of industry as it is of labor.

If causes of distress in the low back area and pain down one or both legs cannot be eliminated, somebody should be called in to try to teach the unfortunate victim that he or she should try to live with it and not necessarily become a dope fiend, wind up in a psychopathic ward, or go all out to try to get everything in accordance with the compensation laws. But if the individual deserves to receive compensation, he should obtain it honestly. There is nothing wrong with the compensation laws, but there is much deserved criticism of how they are administered in many areas of this country.

Industry cannot always afford to give a man a job that fits his back.

Not all of the numerous deviations from the normal as detected by the x-rays, should disqualify a man from holding a job. There are many defects that definitely contribute to instability of the lumbar and lumbosacral regions which, under stress and strain, are the underlying causes for trouble and indeed the cause for the most expensive compensation in industry.

Physicians are working hard toward an accurate analysis of the situation, but there is no "last word" as yet in the low back problem. Further intensive investigation and study is indicated from all angles, i.e., socially, economically, psychologically, industrially, through surgery and medicine, and in accordance with compensation benefit laws.

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Can Xylene (Xylol) Provoke Convulsive Seizures?

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A survey of the properties of xylene, with a case report of cerebral symptoms interpreted as epileptiform seizure.

The use of quick drying paints has become widespread. The time in which the paint dries depends on the solvent, which is generally organic. Aromatic and aliphatic hydrocarbons are used as solvents and the odor of a paint is mostly due to the concentration of these hydrocarbons. They also are frequently the cause of toxic effects in people working with materials where the use of some organic solvent is necessary. On too long exposure various symptoms appear interpreted as an intoxication. The possibility of an organic solvent being the provocative or aggravating agent in certain diseases has led me to report of a patient with a convulsive seizure connected with inhalation of xylene during work. Before describing the actual case a brief description of xylene and its properties should be given.

Definition

Xylene is a coal tar distillate and chemically an aromatic hydrocarbon. It is a homologue of benzene and, owing to its chemical structure, it is also called dimethylbenzene. Xylene exists in the form of three isomers, orto-, meta- and paraxylene characterized by the position of the two methyl groups. Commercial xylene is a colorless liquid.

Uses

As an organic solvent xylene is used largely in color printing industries and in leather manufacture. Moreover, it is a good degreaser. Xylene is also used in the rubber industry substituting for benzene and as a constituent in the production of plastic material.

Often xylene is present in a mixture with benzene and toluene found as solvents in paints and lacquers. In many quick drying paints xylene may be the only solvent.

Properties

The liquid xylene can be absorbed by the skin, but this absorption is negligible. It is more important to bear in mind that it is the vapors of xylene which, when inhaled, reach the organism through penetration of the mucous membranes. Once in the organism xylene is oxidized to toluic acid. This is formed through a loss of a methyl group in the process of oxidation and conjugated with glycine it is excreted as toluric acid.

Jost (1932) has examined the urine of workers handling xylene and products containing it. He could find no traces of the above oxidation product and it may be possible that in the organism xylene is transformed to cresols and hippuric acid.

Symptoms at Exposure

The symptoms xylene produces in people exposed to it are varied and depend on the irritant action it exerts on different organs. Most frequently the general signs which characterize any intoxication are found, such as fatigue, headache, nausea, dry throat, vertigo, irritability and lack of appetite. In the more severe cases tremors, cardiac distress, nosebleed and ataxia may be found.

Xylene has a direct action on the vessels, causing a dilation followed by a constriction.

Hirsch (1932) studied the effect on the heart

and blood pressure in 34 workers at a printing office where xylene was used as a cleaner. The size and form of the heart were examined in radiographs. He ascertained that a long exposure to the vapors of xylene has a deleterious effect on the heart. In about half of those examined the size and form of the heart were considered pathological and in a still greater number the aorta was markedly widened. There is no reference to the age of the examinees nor to any previous sick history.

The systolic blood pressure, with an estimation of 120 as normal, was lowered in 19 workers. This hypotonia seems only to have been investigated with attention paid to the effect xylene may cause. Other possible factors are not mentioned.

The urine was also examined for the content of urobilin and urobilinogen. In 18 of the 34 workers an increase was noted.

Many substances foreign to the body exert an injurious effect on the blood forming system and aromatic hydrocarbons have been considered belonging to these. This is true of benzene which causes an aplasia of the bone marrow. The homologues toluene and xylene give the opposite result. By singular intraperitoneal injections in experiment animals, Batchelor (1927) found a hyperplasia of the bone marrow.

As regards the peripheral blood, Browning (1943) states that the classical signs are anemia, leukopenia and a relative lymphocytosis. The last feature is especially stressed as this may appear long before the leukopenia.

Xylene may also injure the liver and kidneys. The increased content of urobilin and urobilinogen in the urine as reported may as well be explained by the liver damage.

The Importance of Volatility to Toxicity

When discussing the toxicity for human beings of xylene one must take into consideration that this substance is most often used in combination with other materials each of which may be equally toxic. Among the aromatic hydrocarbons, however, xylene is considered the most toxic and responsible for this is the isomer paraxylene. Toluene and benzene follow xylene. This order of toxicity only applies to a shorter exposure to the various substances. On longer exposure it reverses, i.e., benzene is the most toxic in view of its destroying effect on the blood forming tissues.

The MAC value for benzene is 35, toluene 200, xylene 200 and their respective boiling points are 80°C, 110°, and 135°C. Because of its volatility xylene is excreted from the body at a slower rate than benzene, a condition which adds to its toxicity. As xylene is less volatile the absorption of it by the respiratory organs was considered to be more difficult and thus the toxicity of a minor degree (Hirsch, 1932). The concentration of xylene has been estimated where it has been actually handled and at head level of the worker, but no greater difference has been noted.

Judging by the symptoms and the objective findings it has become quite evident that aromatic hydrocarbons are more toxic than aliphatic. The progressive and more severe damages to the blood forming system have been found in a greater proportion among workers exposed to organic solvents containing aromatic compounds. Moreover, subjective complaints have been recorded to a higher degree when aromatic solvents have been used (Brachmann, 1937). It may therefore be justified to substitute aromatic compounds with aliphatic.

Own Case

Eight men were painting gun towers with paint containing 80% xylene and 20% methylglycolacetate. The paint was spread by brush and spray. On spraying, the workers were told to use masks. When working in the fresh air the workers felt no discomfort. Inside the tower, however, a strong smell identified as xylene was noticed and this caused the workers headache, vertigo, gastric discomfort, dryness of throat and feeling of slight drunkenness. These symptoms appeared after about half an hour but vanished after a few minutes in the fresh air. Ventilation of the gun tower was achieved by a stream of fresh air coming in at floor level and sucked out at the ceiling. According to the workers this circulation caused such a draught that work was impossible, and the ventilation was therefore never switched on. In order to counteract any discomfort the workers were told to go outside for 10 minutes every half hour.

One afternoon about an hour after work one of the workers, a boy of 18, while cycling home suddenly felt weak and slightly dizzy. At home he noticed people talking, but could make no sense of what was said. He could utter words but without coherence and after a little while he completely lost the capacity of speech. He had a staring gaze and soon found difficulty in breathing. He became unconscious. His head and eyes were rotated to one side. Chewing was observed, but no foaming. There were short, sharp and interrupted jerks of the upper and lower limbs. There was no incontinence of urine and feces. After about 20 minutes the patient recovered consciousness. He was sent to the hospital where he had another fit but of much shorter duration. On examination all of his reflexes were normal. The plantar reflex was not examined. Pupils reacted normally. Blood pres-

sure was 120/75. Hb. was 96%. R.B.C. was 4.82. W.B.C. was 8,900. There was no differential count. Blood sugar was 0.24%. S.R. was 6 mm. There was an x-ray of skull that revealed no pathological changes. There was nothing pathological in the EEG. When the patient had recovered consciousness he felt quite well and remained so until he was discharged a week later. At the time of this incident the boy had been working with paints for two months.

Comment

Despite the negative examination, the behavior of the patient seems to vindicate a convulsive seizure. A certain sensitivity to seizures of this kind in the patient may be suspected by the fact that at 14 years of age he had sensations which might be regarded as an epileptic aura and immediately following this a fit of cramps. He did not lose consciousness.

The question then arises whether organic solvents, and especially those containing aromatic hydrocarbons, can provoke seizures in patients with latent epilepsy.

In large concentrations aromatic hydrocarbons have a narcotic effect on the organism. In smaller doses, whether repeated or singular, they have a stimulating influence on the central nervous system. In clinical observations of patients with slight exposure to xylene, nervous irritability, headache, gastric discomfort and the feeling of slight drunkenness have been noted; all symptoms which may be ascribed to excitability of the nervous system.

Estler (1935) has carried out experiments on mice with different hydrocarbons. When small and medium doses of xylene were administered the mice showed a decided ataxia localized to the hind legs. The feet and legs were rotated outwards and kept in abduction. Later this ataxia was followed by a paresis and the lower extremities remained fixed in the atactic position. The tails took an S-like form which was not constant. On the day of inhalation, all mice showed interrupted muscular contractions in their extremities and irregular movements. A short time after inhalation of xylene a distinct clattering of teeth was heard. Regarding this observation Estler found some difficulty in stating whether this was due to clonic contractions of central nervous origin or to the diminished body temperature noticed after inhalation. Reference is made to other workers who have noted cramps in the extremities of various animals exposed to benzene. There is no doubt of the cerebral origin of these contractions.

As already mentioned, observations of human beings disclose that the central nervous system is affected in some way under the exposure of a hydrocarbon. Besides headache and gastric discomfort, a patient with latent epilepsy constantly complained of increasing seizures when exposed to the vapors of xylene (Stocké, 1928). This author has also made the interesting observation that people working with xylene are sensitive to alcohol. He believes, however, that the slightly elated state following consumption is not due to the alcohol itself. It is the presence of the slowly eliminated xylene in the organism which is at fault. Alcohol facilitates the diffusion of xylene in the body. The approach of xylene into the brain tissue is thus promoted. The barriers of lipoids are easily broken through due to its fat solving capacity. According to Stocké this favors the concept of a xylene rather than an alcohol inebriation.

In view of what has been reported on the effect of xylene and other organic solvents on the nervous system, it may be appropriate to pay some attention to the risk of their use, and this especially if the workers concerned suffer from incapacity of nervous origin. People with hereditary or acquired disease are sometimes restricted in the work they may perform regardless of their general health. Despite the long intervals between each seizure the epileptic patient has been safeguarded by rules which to him may seem rather strict. As long as the true origin of the disease is concealed, and consequently a successful treatment cannot be pursued, more might be gained in giving rules appearing somewhat austere than in leaving the patient entirely on his own.

Summary

A survey of properties of xylene is given. One patient is reported who has had pronounced cerebral symptoms interpreted as an epileptiform seizure in connection with exposure to the vapors of xylene. In current literature on the subject no such case has been reported nor has any mention been made in the textbooks. The possibility of xylene as an aggravating or provoking agent in special disease is explored.

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AIR POLLUTION

from Soldering Fumes

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There is no evidence of any abnormal risks of lead poisoning of persons doing ordinary soldering work.

In metal factories where assembly work is carried on, a great deal of soldering is often involved. The solder used is almost always a tin-lead alloy, and it may be assumed that larger or smaller quantities of lead escape into the atmosphere. For this reason, soldering is regarded in certain countries as dangerous work, and women and girls are not allowed to perform it. It seemed to us desirable that we should be better informed about the risk of poisoning. It was therefore decided to undertake investigations into various aspects of air pollution in a number of departments where soldering was done as part of the assembly routine.

The investigations described below were primarily intended to constitute nothing more than an approach to the problem; we are aware that only provisional conclusions can be drawn from them, and that further investigations will be necessary. (See "Conclusions.")

General Lines of the Investigation

We have tried to gain an insight into the problem (a) by subjecting a number of employees from certain assembly departments to clinical examination, and (b) at the same time carrying out air analyses in order to determine the lead concentrations to which solderers are exposed. All these investigations were exclusively concerned with the danger from lead.

Other aspects of soldering, such as the possible harm or nuisance caused by resin components and the like, were not explored.

The investigations were carried out in two assembly departments; (1) a large department where 475 men and girls are engaged on assembling television sets, and (2) a department where 250 girls are engaged on assembling radio sets.

Some time previously, lead concentrations had been determined in two other departments, here called (3) and (4), where molten tin alloys were being used in a different way. The findings have been included in this report for the sake of completeness.

Department three employed about 30 girls in dip-soldering capacitors and resistors, and department four employed five men tinning small objects by dipping them in large baths containing molten lead alloy.

In one and two, only resin-cored solder consisting of 40% lead and 60% tin is used.

Medical Examination

In the television and radio assembly departments, 42 employees were picked whose duties included soldering. Our endeavor was to select those who had the greatest number of soldering operations to perform and who had been doing the work for some time. The personnel of these departments is mainly female, and accordingly women made up the majority of those examined.

A note was taken of the number of soldering operations performed per hour by each employee. From these data it was possible to calculate the amount of solder used by each individual, the consumption per 100 operations being known.

At each bench position where soldering is done there is normally a small fan which sucks away the fumes arising from soldering. The fumes thus removed are not piped off, however, but merely dispersed throughout the shop.

Choice of Criteria

The two criteria chosen for the medical examination of employees were (1) coproporphyrinuria and (2) basophilic granulation.

The first symptoms of incipient lead poisoning, familiar from descriptions in the literature, are increased excretion of coproporphyrin III with the urine and an increase in the number of stipple cells in the blood.[1] Fortunately, the two methods of examination happen to be convenient for employment on large groups.

On the day that the lead content of the air of the television and radio assembly departments was determined, blood smears were taken from the 42 selected employees, who also handed in specimens of their morning urine in bottles that had been provided. The urine tests were performed without delay. The coproporphyrin content of these employees' urine again was determined in a second test three weeks later.

Coproporphyrin Determination Method

The semiquantitative method of determination with Donath's apparatus[2] was the one decided upon. In this method a precipitate is obtained by treating the acidified urine with ether; the precipitate is then irradiated with ultraviolet light and its fluorescence color compared with the standard colors on a set of paper discs.

RESULTS

Concentrations gamma per liter	Number of persons 1st test	2nd test
0-100	34	40
100-200	4	—
200-400	2	2
400-800	2	—

Determination of Basophilic Granulation Method

For the purpose of determining the basophilic granulation of the blood, a blood smear is fixed with methanol and then colored with an alcoholic methylene blue solution Lane[3]. The film is examined under a microscope with dark ground illumination and the number of stipple cells counted, the total number of cells being about 10,000. We disregarded the fine stippling that is sometimes visible in the cells.

RESULTS

Concentrations	Number of persons
0.-0.25%	39
0.25-0.50%	1
> 0.50%	2

It was remarked that no correlation existed between individuals with higher percentages of basophilic correlation and those exhibiting a prophyrine content greater than 400 γ/L.

Invitations to undergo a further check were extended to four employees who had been found to have either a rather high coproporphyrin III excretion rate or a rather high basophilic granulation. All four were girls, three living in Eindhoven and one in Belgium.

It was suspected that lead present in the domestic water supply might be the cause of the higher figures, and accordingly the girls were requested to bring a sample of drinking water from their homes in special bottles of lead-free glass that were given them.

All four were again subjected to the tests; hemoglobin content also being determined.

RESULTS

	Basophilic Granulation %	Porphyrine. gamma per liter	Hb. units
1 (Eindhoven)	0	< 50	87
2 (Eindhoven)	0.1	< 50	88
3 (Eindhoven)	0.1	< 50	80
4 (Belgium)	0.2	< 50	81

Analyses of Drinking Water

The employees resident in Eindhoven naturally drank water from the Mains; it was found that the Belgium girl was drinking well-water.

1 (Eindhoven)	9	gamma/Pb/L water
2 (Eindhoven)	41	gamma/Pb/L water
3 (Eindhoven)	46	gamma/Pb/L water
4 (Belgium)	388	gamma/Pb/L water

The fourth sample also contained a great deal of iron.

It is not known whether these samples of water from the Mains were taken after the water had been at rest or after it had been running for some time. The values of Samples two and three agree rather well.

Van Loghem[4] indicates a safety limit of 0.3 mg Pb/litre for water that has been at rest in underground mains for eight hours. An intake of 0.5 to 0.8 mg Pb per day can be regarded as safe; this corresponds to about 100 gamma/L. The concentration found in the well-water of case four was 388 gamma Pb/L, and somewhat excessive.

Measurement of Lead Concentrations in Air

Faced with the task of investigating a large department with hundreds of soldering positions, we were obliged in the first place to limit the number of sampling points. Four positions were selected at which the consumption of solder was known to be highest; it was therefore the worst conditions that were picked out for investigation. The air samples were taken from points as close as possible to the noses of employees while they were doing their normal work. Each time a sample was taken the fan that normally removes the soldering fumes was switched off. Sampling was twice repeated on later occasions at the same bench positions.

It was considered not unlikely that higher concentrations might exist away from the nose. Accordingly, a sample was taken directly above the point being soldered, in the fumes.

Initially, sampling was done with the paper filters (Schleicher and Schull 589) that we normally use for other measurements. Impingers were known to be less efficient for this purpose. Electrostatic filters were not particularly safe in the circumstances prevailing in this assembly shop. It was soon found that the efficiency of sampling was variable as well as low (sometimes as low as 28%). "Millipore" filters were therefore adopted; as stated in the literature,[5] these are particularly suitable for collecting the finer particles quantitatively, and they did in fact work with an acceptable degree of efficiency, from 83% to 91%. We were able to show, by photographing the filters under the electron microscope, that the particles of solder they strained off had dimensions between 0.04 and 0.1 micron. Resin residues and metallic compounds opaque to the electron beam (oxides) were also found to be present.

Samples were taken over periods of 30 minutes; in this way enough lead was collected for the lead content to be determined by the dithizone method[6] after it had been extracted from the filter with dilute nitric acid.

RESULTS

Department	Number of Samples	Concentration in gamma/M^3			
		nose height		in the fumes	
		average	extremes	average	extremes
1	12	72	38- 94	104	67-123
2	8	28	18- 45	-	-
3	10	47	30- 60	67	40- 80
4	2	150	134-166	-	-

Some spread in lead concentrations was found; extreme as well as average values are included.

The MAC currently accepted for lead is 200 gamma/M^3. The concentrations due to soldering are all below 100 gamma/M^3 though they are somewhat higher in the fumes. The number of points sampled was on the low side.

Conclusions

Our examination of employees regularly engaged on soldering work has failed to reveal any fact which might point to their suffering from lead poisoning. In no individual was a high coproporphyrin content combined with an excessive percentage of stipple cells. It is true that some individuals exhibited values in excess of 200 gamma/L and 0.25% respectively for porphyrin and stippled cells which are regarded as the normal ones, but the number of such persons was no greater than might be expected in a group of this kind. Lead concentrations present an air and due to soldering were all found to be under 100 gamma/100M^3.

The MAC's currently accepted for lead in America and England are 200 gamma/m^3 and 150 gamma/m^3 respectively; compared with these, our figures cannot be said to give evidence of any abnormal risks for persons doing ordinary soldering work.

One or two aspects remain to be investigated more thoroughly. In particular, since employees' hands are so frequently in contact with lead alloys, there is a chance that they are absorbing additional lead through the mouth. There have been fairly large differences in the porphyrine content of the urine from one person as determined at different times. More detailed investigations into these changes are now in progress.

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PHILOSOPHY of REHABILITATION

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While an individual is being physically restored, the other aspects of a rehabilitation program should be proceeding, providing him with a correct mental atmosphere.

The basic concern of rehabilitation is not with programs and conferences, not with different professions and disciplines and not with techniques and apparatus. The basic concern of rehabilitation is with people.

People don't live in isolated booths. They do not suffer in isolation, nor should they be rehabilitated in isolation. The person must be worked with as part of a community rather than as a specified individual who has certain things wrong with him, or who, purely from the standpoint of inactivity or other aging processes, has become unable to fulfill his accustomed place in society. The community must recognize this problem and must face it; the community as a whole must find an answer to it. Community planning is needed.

The philosophy of rehabilitation has been aptly expressed many times by many people. As long ago as 1895, Dr. Simon Baruch, the father of Bernard Baruch, stated in his report as chairman of the staff of Montefiore Hospital for the chronically ill in New York, "It will be a proud achievement when our records will tell that a goodly proportion of those who have entered our gates, only to die in peace, have again issued from them entirely or partially restored, and enabled again to enter upon the battle of life from which they had regarded themselves as permanently banished." Dr. Baruch's concept is the essence of the rehabilitation philosophy. The purpose is to take these damaged people and get them back into their proper place in society.

Rehabilitation has been defined as restoring the impaired individual to his optimum place in society, physically, emotionally, socially and vocationally. All of these aspects of his life are taken into account, and an attempt is made to improve him in all of these areas.

Physical restoration should be a joint effort by many different individuals. Physicians, nurses, therapists — whether they be speech, occupational, or physical therapists — prosthetists, or orthetists, all contribute to the physical restoration of the patient. They play individual roles, but in a joint fashion. All of the fields of medicine are utilized, but to a large extent physical medicine is the foundation of the whole program. Physical medicine, of course, includes physical therapy, occupational therapy and the rehabilitation techniques that are carried out in a physical medicine department.

Physical therapy includes any type of treatment by physical means, whether it be heat, cold, water, light, electricity, massage or exercise. In occupational therapy, crafts and arts with remedial objectives are used as a means of treatment. Braces, splints and prostheses are ordered as they are needed to support and strengthen the patients. By combining all of these efforts it is possible to restore the people to their maximum physical potential. If they have arthritis, for example, the internist, the nurse, the occupational therapist and the physical therapist can all get together on a combined program of improving range of motion and strength in the involved joints, reducing pain and attempting to get the arthritis under control.

While the individual is being physically restored, the other aspects of this program should be proceeding, providing him with a correct mental atmosphere.

Motivation is the key to the whole problem.

Presented before Conference on Rehabilitation of the Patient at Home or in Nursing Homes, School of Public Health, University of Michigan, Ann Arbor.

Getting these people to understand that they must make the most of what is left, and not worry about what has been lost, is important. These people need much love and understanding. Time and sympathy are essential to getting a good firm footing so that they will feel needed. They must feel that they have a place in society and that society wants them to have that place. Those who are caring for them must motivate them, must get them to feel that this is what they should do. Without such motivation, the rest of the program would be virtually ineffective.

In addition, the social environment of the individual fits in closely with his mental picture. Community programs play a more important role as one gets into the social aspect of life, whether this be a community-life experience, such as the Presbyterian Village in Dearborn, where aging normal individuals live together in a community setting, or whether it be for purely recreational purposes. This type of atmosphere is important to these people; they must have a social-mental outlook which is uplifting and which will make them want to get out and have a more important place in society.

The economic aspects are tremendous, both from the individual's and the community's standpoints. In considering the investment, one must consider not merely the dollars involved, but what is to be accomplished. During the Korean action and during the latter part of World War II, there was a manpower shortage and additional workers were needed. The problem was where to find them, and this helped to point up the present program of rehabilitation. It was at this time that Bernard Baruch stated that the investment in rehabilitation is an investment in the greatest and most valuable of the country's possessions, its human resources. The present attitude is to conserve human resources, to get these people back to their optimum physical and mental status so that they will be active, contributing individuals in the community. Federal, state and local programs have been initiated and are available for help in rehabilitation planning throughout the communities, and they certainly should be called upon as needed.

Vocational aspects of rehabilitation involve testing these individuals for their aptitudes, counseling them after the testing so that it can be explained to them where their maximum utilization will lie and training them. Training can be prevocational or vocational. This is a continuing program; it begins in the hospital or nursing home and carries over to the community program so that the individual fits into a spot which has to some extent been prepared for him. It is not just the vocational aspects that should carry over, but the physical, social, mental and economic programs as well, so that the individual actually does become integrated as part of the community.

One concept of the philosophy of rehabilitation has been quoted by Dr. Donahue in *The Rehabilitation of the Older Worker*. "That this is a hard task, none who knows the hospital life can doubt. That it needs special qualities and special effort, quite other than the average range of hospital devotion, is obvious. But it saves time in the end, and without it success is more than doubtful. The crucial period is the time spent in the hospital. Use that period to recreate not only the body, but mind and willpower, and all shall come out right; neglect to use it thus and the heart of many a sufferer and of many a would-be healer will break from sheer discouragement. A niche of usefulness and self-respect exists for every man, however handicapped; but that niche must be found for him. To carry the process of restoration short of this is to leave the cathedral without a spire. To restore him, and with him the future of our countries, that is the sacred work."

Keeping Blood

Indefinite preservation of whole blood is a practical possibility at an early date, according to Office of Naval Research. The government agency has contracted with Linde Co., Tonawanda, N. Y., to perfect processes for freezing, storing and thawing of whole blood in liquid nitrogen. Forming the groundwork are pioneering results of research conducted jointly by ONR and Navy's Bureau of Medicine and Surgery several years ago. These demonstrated practicability of using liquid nitrogen to freeze blood rapidly to minus 195 degrees centigrade. No deterioration or alteration of properties was evidenced clinically after the blood was administered to patients.

Continued studies by the Linde Co., said ONR, have produced successful results in freezing volumes of one pint in fewer than 30 seconds, compared with 55 minutes under conventional methods. Tests show that 85% of the cells are viable after protracted storage, which is a better mark than 21-day blood bank blood can show.

—*Washington Stethescope*, October 31, 1959.

In keeping with this journal's activities at the international level, this abridged annual report on the health of dock workers at Marseille is presented. Similar reports for some other countries have appeared in various medical journals but not necessarily for the same year. Examination of such records affords opportunity for comparison with programs and procedures for related work in the United States.

The HEALTH OF DOCKWORKERS in France

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Schedule of medical activity: The following statistics, which will serve as a commentary on the professional activity, were established by the secretarial staff.

A. Hiring
   1. Numbers of examination: 479
   2. Number of refusals: none. (A cardiac case sent for further examinations in a special service of the hospital did not return.)

B. Routine medical check ups
   1. Number of annual examinations: 3,937 plus 350 discovered earlier
   2. Number of examinations of persons exposed
      a. in a toxic position
         see commentary
      b. in a security position
   3. Examinations of juveniles: 20
   4. Other examinations (pregnant women, etc.) - see commentary

C. Routine special examinations: 2,431
   1. Upon resumption of work
      a. after sickness: 652
      b. after accident: 1,779

      The number of examinations upon resumption of work increased 62% as compared with the year 1956.
   2. Because of change in position: 16
   3. Because of reclassification: a few

D. Spontaneous consultations on the part of personnel: 974

E. Number of referrals: 335

F. Number of radiological examinations
   1. thoracic radioscopies at the medical center: 4,287
   2. thoracic radiographs made by specialists in the city: 41

   Otherwise, the number of spinal radiographs was of considerable importance.

G. Number of complementary examinations charged to the employer: none

H. Professional maladies identified: none

I. Accidents on the job (number of accident cases cared for at the Service)
   1. first treatment: insignificant number
   2. repeated treatment: insignificant number
   3. foreign objects in the eyes: 12

J. Number of workers hospitalized because of the work.

   Statistics impossible to establish. Numerous cases of hospitalization or home treatment ordered after accidents at work or temporary affections of a professional origin, the exact number of which remains unknown.

DOCUMENTARY DATA

Commentaries on data in Section A to G of the Schedule of Medical Activity.

A. 1. Hiring (see A). The number hired has more than doubled since the year 1956. The majority of the candidates were directed to the Regional Social

Security center for spinal radiography. For the designation of the candidates for these radiological examinations, the following should be taken into consideration: age, previous traumas of the spine and the employment at which the worker would be engaged. Although the radiological examinations of the vertebral column of docker-workers would be taken in charge by the preventive services of the social security service, it was foreseen that an important subsidy would be needed to cover the expenses of eventual complementary examinations of persons under social benefits. Routine radiological examinations of candidates for employment, in the name of prevention, would in most cases provoke the expenditure of unjustified supplementary amounts. In the same way, in the name of prevention, one could permit complementary ophthalmological, otorhinolaryngological, cardiological, or neurological examinations.

In the great majority of cases, a thorough clinical examination by the company physician should be sufficient. Nevertheless, in any case where the doctor judges that a complementary radiological examination is indispensable before a worker is hired, either for the safeguarding of his health or to avoid administrative complications, he should not hesitate to require it.

Definitively, considering the manual work of the labor force on the docks, radiography should be used in the following cases:

a. former traumas of the vertebral column
b. former operations for discale hernias, and subjects suffering from accentuated disk arthrosis, kyphosis and scoliosis
c. congenital spinal malformations
d. candidates over 45 years of age, in order to discover the osteophytosis and spondylarthritis due to aging
e. candidates who claim to suffer from spinal troubles, coughing, sneezing and diarrhea

B. Routine check ups

In accordance with the law, we indemnify dock workers who undergo obligatory physical examinations outside of working hours. However, those who come to be examined during the course of their work do not enjoy this compensation. We have thought that it would have appreciable advantages to consider the first physical examination undergone by a worker during the course of the year upon the occasion of a consultation or resumption of work as an obligatory routine check up. If this procedure were put into execution, it would procure beneficial results from the point of view of economy of time, both for the worker and for the physician; it would contribute to increased production in the enterprises and it would augment the number of annual physical examinations.

If the number of annual examinations diminished from the year 1956, the number of known cases, on the contrary, has not varied. Hundreds of the latter come to consult with the physician, and often without reasonable motive. The role of the occupational physician is delicate, for it is difficult to make this category of consultees understand that they must not come so often. The doctor's humanitarian and social task obliges him to make them welcome always.

1. Number of examinations of persons exposed in toxic positions: none
2. Number of examinations of persons exposed in security positions: none

It is necessary to make clear that the workers employed in the vast dockyards, either on land or on board ships, among all sorts of machines, are exposed constantly to various accidents.

C. Special routine examinations

1. upon resumption of work: 2,431
   a. after sickness: 652
   b. after accident: 1,779

The number of physical examinations upon resumption of work has increased 62% since the year 1956. This proves that absenteeism because of sickness or accident has increased.

As a comparison, it is interesting to note the following statistics:

1. 1954. Physical examinations upon resumption of work: 539
   a. after sickness: minority
   b. after accident: majority
2. 1955. Physical examinations upon resumption of work: 496
   a. after sickness: minority
   b. after accident: majority
3. 1956. Physical examinations upon re-

sumption of work: 1,500

a. after sickness: 427

b. after accident: 1,073

Changing positions and reclassification are daily problems for the occupational physician. A change of position can be effected without too many difficulties. As for persons who are candidates for reclassification because of lessened physical ability, their case is far from being resolved.

4. Spontaneous consultations: 974

The consultations increased by 100, which does not signify that the maladies were more numerous. This augmentation can be attributed to repeated and unjustified consultations by certain persons.

5. Number of referrals: 335

The number of sick persons referred to specialists or to practicing physicians increased by 50. This figure is in accord with the one for consultations.

The consultations at the medical center not only are excellent means of drawing the workers to us and thus inspiring their confidence in occupational medicine, but they contribute effectively to the discovery of illnesses and to the eventual prevention of some accidents, through early diagnosis and cure of affections as soon as possible.

The occupational medical services, in addition to their role of surveillance of the health of the workers, amelioration of working conditions, and prevention of accidents and illnesses, are the veritable centers of diagnosis and of emergency treatment, from which the consultants or accident victims are directed immediately to the hospitals or the treating physicians.

The approximate number of different affections recognized in 1957 is grouped in the table below.

According to the figures, the three principal affections involve the digestive, cardiovascular and respiratory illnesses; the most frequent in 1957 were those of the digestive tube and its annexes. Next come the affections of the cardiovascular apparatus, and last are the sicknesses of the respiratory system. Maladies of the digestive tube more than doubled; cardiovascular and pulmonary affections increased about 20%.

Diverse affections	Dockers	Enterprises	Total
digestive apparatus	463	105	568
cardiovascular apparatus	401	47	448
respiratory apparatus	302	28	330
diverse sicknesses	225	34	259
nervous system	177	15	192
O.R.L.	113	18	131
dermatology	109	20	129
genitourinary organs	65	16	81
ocular-affections	62	16	73
locomotive apparatus	1,874	97	1,971

The proportional relationships of these different affections are not particularly worthy of attention. Statistical or numerical errors could modify our conclusions. Actually, maladies of these vital organs have been diagnosed annually in approximately the same proportions since the opening of our service.

Functional troubles of the locomotive apparatus, usually temporary, involving the joints, the muscular and bony systems and the spinal column, have increased impressively. The traumatic sequelae recognized in the course of the years 1956-1957 could be attributed to a greater number of accidents on the job.

6. Number of radiological examinations

Based on the approximate figure of 4,287 annual physical examinations, one could admit in principle that an equal number of radioscopies were taken at the medical-social center. Still, it is very likely that not all this force had to undergo a radioscopic examination of the thorax. On the other hand, as we stated the previous year, when we judged it necessary we required persons reporting for examination upon resumption of work or on the occasion of a consultation to undergo a thoracic radioscopy.

The cardiopulmonary radioscopic examination is obligatory at the time of employment; it is not required during the routine periodic examination. Without neglecting this important aid to the discovery of pulmonary illnesses, its use is limited to cases where it seems indispensable.

Number of thoracic radiographs performed by specialists: 41. Decrease from the year 1956.

The number of spinal radiographs was of considerable importance.

7. Number of complementary examinations charged to the employers: none

a. hemobiological examinations: 14, charged to the social security service
b. radiological examinations of the spine: charged entirely to the regional social security. See previous commentary.

A certain number of workers were referred to specialists for complementary examinations in view of treatments, reclassification or retirement.

B. Commentaries on observed illnesses connected with the work

1. Diffuse pulmonary sclerosis — as we have indicated previously, this work is normally conducted on the docks, where there is usually a dusty atmosphere. Numerous workers therefore suffer from diffuse pulmonary sclerosis, which is the principal cause of dyspnea, the symptom complained of by most of our pulmonary consultants. One should not fail to mention the forms of dyspnea suffered by cardiac and mixed cardiac-pulmonary cases, which may also be connected with the work.

   For a number of years we have followed certain cases of incipient pneumoconiosis through the various stages, from pulmonary sclerosis through the micronodular and nodular phases and up to the forms of condensation or parahiliary and subclavicle pseudotumors without cardiac complications. We repeat that the principal professional affection at the port is diffuse pulmonary sclerosis which may turn toward the first stage of pneumoconiosis, without provoking functional pulmonary complications, however.

2. Rachialgia — with regard to the possibility of rachialgia's being attributable to manual work without traumatic origin, there are as many consultants from among engine drivers as from among the dockers. The first claim it is caused by vibrations experienced while they are in a sitting position in their tractors, etc.; the latter blame the efforts of lifting and moving heavy burdens.

   With either drivers or dockers, dorsalgia of a professional character, although frequent, is still often a subject for litigation, especially in cases where there is obviously a complete lack of traumatic origin. Still, considering the accelerated and often heavy work of these workers, it is necessary for us to resolve these problems in a humane manner and with good judgment.

3. Skin affections — with regard to a certain number of skin affections of an anaphylactic origin and sometimes secondary infections, we refer to the commentaries in previous reports. Skin manifestations of a professional origin are not rare on the docks.

4. Affections of the respiratory system — the cases of rhinitis of the type of acute spasmodic tracheobronchial coryza extending up to asthmatic seizures are encountered more and more rarely. The few cases presenting functional pulmonary troubles with asthmatic respiration and dyspnea may be attributable to the inhalation of dusts during the course of the work, but this has not been verified.

   The periodic asthmatic attacks of certain dock workers can be the consequences of daily work on docks saturated with dusts, coming from the manipulation of various merchandises or of certain kinds of cereals, containing minute pathogenic particles of a vegetable, mineral or animal origin. In most of the cases, the allergic manifestations appear after the first contact of the hypersensitive subject with the pathogenic dusts; a single prescription of rest has caused the professional syndrome to disappear within a few days.

5. Gastrohepatic affections — it is certain that numerous common gastric, hepatic and intestinal affections are provoked because the workers give little time to observing the elementary principles of hygiene before meals eaten hastily on the docks. To avoid these digestive syndromes of a temporary but at times persistent character, the creation of canteens provided with sanitary installations would be advisable.

6. Cardiovascular affections — arterial hypertension and cardiac hypertrophy recognized among dockers past 50 could justifiably be considered as a consequence of the manual labor. It is evident that these workers, constrained during a number of

years to perform heavy muscular work, would have cardiovascular repercussions at a relatively young age.

Periodic inspection of the work areas and physical examinations of the workers have diminished the professional risks and produced satisfactory results.

7. Treatment given for professional maladies at the medical services — It would be logical for the legislator to attribute this task to the doctors in the factories. The occupational physician prevents health troubles if possible and discovers professional maladies if they occur; it would be natural for the role of treatment to be confided to him. Obviously, each factory presents particular risks, the maladies of a professional origin being based on the raw materials and special processes being used.

The frequence of manifestation of these maladies in a factory is in no way a function of his importance nor of his effectiveness. The eventual risks depend on the preventive measures employed.

The occupational physician must be perfectly familiar with the professional maladies and because of this familiarity, may be considered better qualified to be charged with their eventual treatment than many practicing physicians.

C. Commentaries on accidents at work

As during the preceding years, the figures on accidents at work in 1957 continue to show a considerable augmentation, in relation to the sicknesses.

At the port professional diseases are very rare, while the accidents may be calculated in the thousands. This fact demonstrates the great importance of having accident centers where all accident victims, whether the accidents are minor or serious, should be directed immediately. The goal of prevention of professional risks is not limited to the social and humane purposes. Certainly, accidents have a prejudicial effect on the workers' physical and mental state, as well as their morale. However, they also cause irreparable loss of work days and a considerable reduction in the industrial production.

It is for these reasons that the security services have devoted themselves to the problems of amelioration of the work conditions with a view to accident prevention and collective safety. Mechanical progress in the machines used has no doubt contributed to the improvement of the work conditions.

As for the lessening of professional risks, we must be prudent and leave this subject to the discussions and commentaries of the technicians.

Since the human factor plays a very important role in the majority of accidents, posters and circulars are utilized to prevent potentially serious risks. Instructive lectures, films, and especially television would be useful methods of putting the workers on guard. However, because of the vastness of the work areas and the distance of the workers' homes from the places where they work, it is difficult to carry out these methods. The loudspeaker system would be useful during working hours, but this measure has never been used regularly.

The machines and dangerous operations would be the occasion of much fewer accidents if the workers were guided by prudence and methodical procedures during the work periods.

Certain accidents depend on the physical and mental state of the workers. There are neuromuscular weaknesses, neurovegetative disequilibrium or dystonia, and sensory deficiencies (ocular and aural affections) which contribute to accidents.

Cardiac auscultation, measurement of arterial tension, both in the arm and in the leg, the search for clinical and physical signs of alcoholism, including examination of the state of the liver

ACCIDENTS AT WORK IN 1957

Risks	Without award	With award	Total	Number of days of temporary incapacity	Deceased
Personnel					
" permanent	467	432	899	15,689	3
" intermittent	235	399	634	20,611	2
Dockers	1,487	3,564	4,651	154,564	5

Of the dockers with award: 3,564

Region involved in the accident:		
head	179	(cranial region: 81)
eyes	37	
upper limbs, not counting the hands	236	
hands	625	
lower limbs, not counting the feet	572	
feet	383	
multiple localizations	473	
imprecise localizations	14	
trunk (between head and lower limbs)	645	(lumbar region: 500
		(spine: 23
		(thorax: 98

and the degree of alcoholemia, early establishment of mental illnesses: these are all of great importance in the prevention of accidents. Hygienic and dietetic advice cannot help but ameliorate health of personnel and thus assist in avoiding professional risks.

Let us recall that the hands are more exposed to accidents than the feet. There were 500 accidents of the lumbar region among the 645 traumas of the trunk. There were very few accidents of the spine outside the lumbar region.

Certain affections, congenital or acquired, of the spinal column are quite frequent among the porters: kyphosis, scoliosis, chronic lumbago, osteophytes, diverse discopathies of an undetermined origin, and sciatic reactions.

Morphological deformations of the vertebral disks, spondylarthritis, spondylolisthesis, and very rarely the osteoarthritis of the elbow and knee and the painful arthritis of the hips, constant or with periodic attacks, are deplorable traumatic sequellae among the dockers.

Spinal arthritis is certainly the most frequent affection among the workers on the docks; it appears habitually in the radiographs of workers in the 45 year age group. According to the figures, painful and recurring dorsal arthritis is rare. Kyphosis and scoliosis in persons suffering from dorsal arthritis predispose to dorsalgia. Traumas are particularly likely to lead to trouble in persons with dorsal arthritis.

In resume, syndromes of the back at different ages in all classes of society remain a disputable problem from the etiological and pathological point of view. Outside of cases of vertebral pathology of definite traumatic origin, degeneration of the spinal disks, spondylarthritis of an undetermined origin, and osteophytes must be considered as normal changes caused by senescence.

As for inguinal hernias, it must be remembered that it is actually admitted in the legislation that these hernias can be considered as the consequence of work, either when they follow violent physical work, or when they result gradually in the course of the years because of manual labor. The inguinal hernia can be considered to have a traumatic origin if the workers has shown no anomalies in that region in the course of previous examination.

Before concluding the commentary on accidents at work, it might be interesting to note the characteristics of the work involved. We can classify the dockers into four categories:

1. personnel who perform light work: hoist operators, packers, guards, sweepers, etc.
2. workers with fairly heavy jobs: sackers, silo workers, etc.
3. those who perform heavier work: workers in the holds of ships
4. the porters who carry weights of 100 to 150 kilograms on their shoulders or heads, fortunately for short distances only.

The workers in category 4 are less numerous and earn twice as much as the others. They are hired very carefully and they are volunteers for this extremely heavy work.

D. Participation in hygiene and safety supervision

The problem of modernizing the sanitary installations on the docks and keeping them in a good functioning state appears to us to be complicated and difficult to resolve under the circumstances, customs and modes of life.

The problem of preventing an excess of cereal dusts in the silos is partly resolved and there has been enormous progress in the amelioration of the work conditions in these locations. On the other hand, in view of the change in the system of unloading cereals and their expedition to their destination in a loose, unpacked condition, the number of sackers has diminished. Actually, a partial dedusting of the cereals is performed by aspirators in the silos, and the powder is heaped in sacks.

In view of the at times insupportable respiratory irritation encountered in the silos and in the holds of ships carrying cereals, it is required that the workers be employed "in small groups and in turns" so that each one can rest for short periods during the work session.

Modernization in industry, the perfection of machines and the acceleration of the work tempo have totally transformed the daily life of the workers. The cooperation between man and machine, while contributing to the very advantageous production, carries with it nevertheless a number of inconveniences which cannot be neglected.

Human effort is not comparable with

mechanical force, and the speed thus imposed on the worker sometimes does not leave him enough time to perform the indispensable hygienic routines. The lack of time to observe the principles of alimentary hygiene can be held responsible for certain functional disorders of the various organs.

Insufficient attention to hygiene on the part of the porters can justifiably be considered as a factor in the flourishing of certain functional troubles of the digestive and respiratory apparatus, of the visual and aural organs and even, rarely, of the genitourinary organs. There are affections of the neuromuscular system and numerous psychosomatic troubles which have an industrial origin.

The reconstruction and modernization of the port have been very successful and have been much admired by visitors. There still remains a number of problems to be solved, including among others, the construction of blocks of modern sanitary installations, which not only will be part of the splendid buildings and docks in Marseille, but will contribute to the amelioration of the sanitary condition of the workers and to the prevention of numerous current affections.

In the course of inspections of the work areas, it has been our duty to study and analyze the working conditions, to observe the rhythm of the workers' movements during the various processes, to learn the qualities and characteristics of the merchandise being manipulated, to note the length of the work periods and the hours of rest, and finally, to see whether the execution of a given job in the required time is compatible with maintenance of health.

It is only through questioning the workers and their supervisors that we can better understand the hard life of the men who work on the docks and participate effectively in the prevention of accidents and sickness in the interest of individual and collective safety.

E. Studies of the work positions

For a number of reasons, it is not possible at this time to study effectively the work positions at the port.

F. Commentary on the general morbidity and on absenteeism

According to the figures, the temporary incapacities of the workers are in general of a nonprofessional origin. For one day of absence for a professional sickness or work-connected accident, there are 15 days of absence for ordinary diseases.

Our figures for the first seven years have demonstrated that among the dockers, there have been eight times more absences for accidents at work than for sickness. The permanent or intermittent personnel other than dockers had twice as many absences for sickness as for accidents.

In 1957 we performed three times as many physical examinations on the occasions of resumption of work for recovered accident cases as for persons recovered from illness.

G. Interior and exterior liaison

1. Interior — according to the needs, we are in liaison with the inter-enterprise committee, the family social service, the work counselors, the personnel chiefs of the enterprises, their technicians and the delegates of the personnel on the docks; we have always been well received and have obtained satisfactory results.
2. Exterior — same commentary as during the preceding years.

H. Other organizations of a medical character in the enterprises

1. Chibron Rest Home — near Signes — no change
2. Infirmaries — in the large enterprises, and first aid posts on the docks: identical with 1956
3. Vacation colonies
   a. at Chibron
   b. at Forcalquier
   c. at Aiguilles du Queyras
   d. family placement in the B.A.

I. Remarks and suggestions concerning occupational medicine

In the aim of preventing complications from traumatic wounds, it might be helpful to have an emergency medical service that could provide treatment on the spot where the accident occurred. This ambulance would be under the authority of the social security service.

Such an organization would contribute to the decrease in the number of future physically handicapped persons and days lost from work, and would avoid the great cost of indemnification.

Letters

To The Editor:

On page 427 of the September issue of your eminent journal appears a statement entitled "Greatest Single Cause of Absenteeism." I find it difficult to accept this at face value. All musculoskeletal disease represents only about 5% of our absences company-wide, i.e., both laboring and office workers. Such disease is responsible for fewer than 10% of our disability retirement cases. Whose data are you quoting?

—LEO WADE, M.D.
Medical Director
Esso Standard Oil Company
New York City

We don't believe it either, but the information is from the Arthritis and Rheumatism Foundation of Michigan.—Ed.

To The Editor:

The Committee on Toxicology wishes to thank you for your cooperation and help in formulating the "Uniform Hazardous Substances Act."

Most of the significant comments made at the AMA conferences were carefully considered and, to a large extent, incorporated in the final version of the model law.

On May 25, 1958, the American Medical Association Bill was introduced into Congress as H.R. 7352 by Representative Curtis.

Although hearings on this legislation have not been scheduled as yet, it would be helpful if you would communicate your support of the bill to Congressman Oren Harris who is Chairmain of the House Committee on Interstate and Foreign Commerce, to which the measure has been referred.

—BERNARD E. CONLEY, Ph.D.
Secretary, Committee on Toxicology
American Medical Association

Abstracts

Arthrography in the Diagnosis of Meniscal Injuries of the Knee

in *The Journal of Bone and Joint Surgery*, October, 1959

This paper reports the experience of using a water soluble contrast medium in 469 patients subjected to arthrographic examinations. The authors point out that previous studies show a range from 53% to 95.3% accuracy in diagnosis. Cases in which the pathology is obvious do not require this medium; however, in every series there is a sizable proportion of cases in which the pathology is obscure and the symptoms and findings atypical. It is in these cases that ancillary method of examination could prove of great value.

Contrast arthrography using 35% diodrast solution was the method employed. The solution is miscible with joint fluid and can be used in the presence of joint effusion in contrast with air which cannot be so used.

In a description of their technique, the authors emphasized thorough preparation of the leg. The knee joint is entered through the lateral extension of the quadriceps tendon just proximal to the patella. The amount injected varies from 10 cc to 15 cc. If joint fluid is present, it is aspirated prior to the injection of the diodrast solution. An elastic band is applied tightly about the knee immediately after removal of the needle. The bandage forces the solution out of the quadriceps pouch onto the meniscal surfaces.

The authors state that the examination is expensive because it requires 30 to 45 minutes of the technician's and roentgenologist's time as well as the use of sterile supplies and the x-ray room. Twelve views, including six stereoscopic, are obtained, in addition to the routine views of the knee. The amount of radiation exposure to the patient was calculated at 140 milliroentgens on the lateral aspect and 700 on the anterior aspect. There are several situations in which the examination seldom gives satisfactory information; these include the presence of marked degenerative arthritis and inability to extend the knee to at least 170 degrees. Since children are unable to cooperate well, the procedure probably should not be attempted on them.

The authors state that diagnosis by arthrograms was correct in 136 cases (73% of a total of 188 cases subjected to analysis). With respect to the medial meniscus, in 50 knee cases with typical history and findings, the diagnosis was correct in 45, or 90%. In 76, with a suggestive clinical picture, the diagnosis was correct in 56%. In 29 atypical clinical cases, the diagnosis was correct in 21 (72%). The over-all accuracy in injuries of the medial meniscus was 80%.

A quite different result was obtained for lateral meniscus tears as only 12 out of 42 cases (30%) were correctly diagnosed by arthrography.

The authors conclude that arthrography of the knee is helpful in diagnosis of medial meniscus lesions, especially in patients with atypical or only suggestive findings. In patients with a

locked knee and typical findings arthrography is neither helpful or necessary. The value in diagnosis of lateral meniscus injuries is doubtful. The procedure is time-consuming and expensive. —JOHN H. SCHNEEWIND, M.D.

The Psychologist in Industry

HARRY LEVINSON in *Harvard Business Review*, Sept.-Oct., 1959

The author points up the speed with which psychological services have been accepted in industry. Psychologists are concerned about the ethical problems involved and management is advised to take "a second look at its psychological services." The psychologist in industry daily confronts clinical problems. He makes judgments about assets, capabilities and limitations of people. His primary obligation in most cases is to management and more often than not his clients do not come voluntarily. The author recounts the experience of the industrial physician and recommends his pattern of procedure in terms of confidential professional relationship be followed. He concludes that, as all psychologists are not alike, management must select carefully the psychologist with whom he is going to work. The concept of psychological "consultants to management" calls for reappraisal, and management must take a more realistic stand in relation to the psychological services it is presently using. —R. C. PAGE, M.D.

Keep Employees Out of the Hospital

E. J. GRACE in *Harvard Business Review*, Sept.-Oct., 1959

The author forcibly alerts management to the true significance of insurance costs, absenteeism and needless surgery. He recounts the trends which call for a fresh approach and appraisal of policies and programs concerning employee health and points up the inefficiencies of existing hospital plans; scant protection for catastrophic illness and the failure to emphasize a preventive approach to medicine. He recommends that management assume its correct role instead of delegating this responsibility to insurance companies and join forces with small but adequate medical groups, even help to establish them where necessary. Dr. Grace concludes that medicine now has the technical and scientific know-how to provide better health care than most employees receive, but medicine "unaided cannot provide the proper setting for applying this know-how." It must act in partnership with industry if the needed facilities for early diagnosis and treatment are to be set up.

—R. C. PAGE, M.D.

Books

Synopsis of Treatment of Anorectal Diseases

STUART T. ROSS (St. Louis: C. V. Mosby Co., 1959)

This 240 page, pocket-sized manual is an excellent synopsis of all of the common and most of the unusual diseases of the anorectal area. The title implies that it deals only with treatment, but there are adequate descriptions of etiology and diagnosis in each chapter. Theoretical observations and all bibliographic references have been omitted. The text is well outlined and adequately illustrated. No attempt is made to describe major surgical procedures, such as abdominal perineal resections. The chapters on hemorrhoids, fistula and pruritis ani are particularly well done. This book can be read with profit by all interns, residents, general practitioners, and by most general surgeons who operate on anorectal lesions. This reviewer knows of no other book of its kind on this subject.

—CHESTER C. GUY, M.D.

Upper Digestive Tract

FRANK H. NETTER (Ciba, 1959) illustrated, $12.50

This handsome oversized atlas is Part 1, Volume 3, in the Ciba series of Dr. Netter's medical illustrations. This section is limited to the "Upper Digestive Tract," but by interpretation that includes the mouth and all its contents. The number of plates appearing is divided into these divisions: Anatomy of the Mouth and Pharynx, Anatomy of the Esophagus, Anatomy of the Stomach and Duodenum, Functional and Diagnostic Aspects of the Upper Digestive Tract, Diseases of the Mouth and Pharynx, Diseases of the Esophagus, Diseases of the Stomach and Duodenum.

The numerous illustrations are accompanied by suitable text in extensive exposition of the structures and states portrayed. By no means are these plates solely anatomical; many are depictions of pathological states and medical procedures. When this Netter series is complete it will constitute a system of medicine in color.

Recently a housewife was heard to exclaim "How in the world did we get along before the days of cellophane?" Paraphrasing a little but with some pertinency, it might be inquired "How in the world was it possible to practice

medicine adequately before the days of some leaning on these collections of medical illustrations?"

Work and the Heart

Eds. F. F. ROSENBAUM and E. L. BELKNAP (New York: Paul B. Hoeber, Inc., 1959) pp. 537, illustrated, $12.00

This report by "74 experts of international repute" is confined to the proceedings of the First Wisconsin Conference on Work and the Heart which was conducted under the sponsorship of the Wisconsin Heart Association, Marquette University School of Medicine, American Heart Association, National Heart Institute and the Industrial Health Council of the American Medical Association. This book was published at the taxpayer's expense under a grant from the United States Public Health Service.

These transactions are divided into these six sections: Basic Physiology, Clinical Physiology, Pathology, Work Classification, Workmen's Compensation and Outcome and Prospects, and total 59 chapters. Part III, maladroitly titled "Clinical Physiology," chiefly is concerned with the disease entities of the cardiovascular system. This justifies mention of the numerous individual chapters: Intramural Hemorrhages and the Histogenesis of Atherosclerosis, The Causal Relationship of Stress to Intimal Hemorrhage and Coronary Occlusion, The Pathology of the Conduction System as Related to General Cardiac Pathology, The Stimulus to Revascularization of Muscle, Incidence of Unsuspected Healed Myocardial Infarction in a General Hospital, Analysis of the Increase in Myocardial Infarctions in Malmo, Sweden, 1935-1954, Relation of Sex, Age and Physical Activity to Sudden Death from Coronary Arterial Occlusion, Circumstances Related to Sudden, Unexpected Death in Coronary Heart Disease, The Relative Etiological Importance of Various Stresses in Cardiac Disorders.

It is in Part V, "Workmen's Compensation," that red flags begin to drop, but few were picked up. Invasions into the controversial were little controverted and complacency seemed to rule the work. It was stated that fully half of the country's middle-aged and older productive workers are affected with some form of cardiovascular disease. These conditions are not work-produced but living-produced, since those who never work in industry present the same disturbing incidence. Every one of these millions of middle-aged and older workers becomes a potential claimant for compensation. While the employer over and over is exhorted to employ the cardiac, only thinly veiled are many intimations that upon the advent of cardiac disability, real and imaginary, every effort will be made to interpret all such as compensable. Time and again that ugly word "exertion" appears. That workman is a "rara avis" who cannot find some exertion in connection with any cardiac episode. Not always is "exertion" defined, which leads to the observation that the pressing of an elevator button or the unlacing of a shoe involves exertion. Much that is evil is reflected in this quotation, "Mr. Kenneth Pohlmann described workmen's compensation as 'an ailing form of social insurance,' which despite earnest attempts to bring it into focus with the changing social and industrial order has remained 'bogged down in a morass of piddling reforms.'"

A major onslaught was upon industrial workmen's compensation for not having kept pace with social progress. In that connection two quotations from Theodore Waters, one of the essayists, are salutary. Mr. Theodore Waters similarly asked for examination of workmen's compensation laws as part of general social legislation, saying that, "Workmen's compensation statutes are being permitted to become health insurance statutes, imposing upon industry the legal obligation to provide compensation for all the ills of mankind." He expressed the belief that, "Should it be socially desirable, health insurance laws should be enacted, but let us not hide them in workmen's compensation." "The fact is that we face a growing tendency in the administration of compensation laws to treat claims for compensation as claims for damages and, in my opinion, this is grossly unfair to employer, employee, and the general public."

Along with the rehabilitation of the cardiac there may be a distinct need for the rehabilitation of industrial compensation systems to remove them from the social insurance category. A wholesome gain may be made by the return to the original concept of coverage for those affections arising and growing out of the due course of employment. In all truth a disabled workman may have urgent monetary needs even though his impairment in no wise is work caused, but the plight of need in itself is a sorry reason for the prostitution of originally well conceived workmen disability insurance coverage. Social insurance of an entirely different order may be requisite and, if not available, legal enactments, not legal prostitution, need be invoked. Ever the cry is "But now as to this man's particular need."

The publishers of this book present it as "destined to become the standard source for all concerned with the increasingly important problem of work in relation to heart disease." More likely it is destined to become a center of hearty, booming controversy, with its contents bringing comfort to many, but outraging many others.

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VOLUME XXIX

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The Return of St. Vitus

The Middle Ages in Europe and notably Germany were marked by a strange phenomenon, mass hysterical dancing. Men, women and children engaged in unplanned endless dancing, ending only with exhaustion. Entire towns, dropping all work, joined in individualistic rhythmic prancing, dancing, shouting, gesticulating motions, with or without music, ever with rhythm but not necessarily with grace. Physicians standing by, without skilled psychiatrists among them, facing a perplexity without precedent, charitably conceded that all this mania must constitute a disease. That concession must have softened the shame of some who could not stop their bizarre antics. Since St. Vitus was credited with the ability to cure this ailment many danced into his chapels. Some may have found surcease. Hence the name, St. Vitus Dance. Centuries later this same name was applied to a true disease better known as Sydenham's chorea, thus adding further to diagnostic confusion.

In Italy of the same period hysterical dancing acquired the term "tarantism" and was attributed to spider bites. Placing responsibility on the tarantulas gave convenient plausibility to ridiculous cavorting, except that there may not have been enough tarantulas to go around. More likely but still not excathedral, the Italian town Taranto may have provided the name, mass hysterical dancing having appeared there.

Mass hysterical outbreaks took on other forms than dancing. Children in groups by the scores convinced themselves that they were cats, climbed trees and by the hour "mewed" plaintively, waggling imaginary tails. Even in retrospect, not a pretty contemplation. Possibly all the Crusades may with justification be labeled mass hysterical processions. Certainly the Children's Crusades in all their pathetic ridiculousness warrant that badge. In 1212 A.D., the shepherd boy Stephen appeared in France in his rickety wagon and gathered some thousands of children in his train. Utterly unequipped, this band perhaps at first dancing in ecstacy moved toward Marseille with Stephen promising by his powers to dry up seas and then on to the Holy Land. Actually those who did not die of pestilence or starvation were kidnapped by slave traders into bondage in Egypt. The second division, twenty thousand children strong, was misled by the boy Nicolas of Cologne in Germany. He proclaimed his own magical powers. That hysterical group with its dancing soon to slow to a crawl, disappeared without a trace save the legend of the Pied Piper. Even that legend is not to be identified with the children's crusade, exclusively and conclusively. So much for historical dancing mania.

Now St. Vitus has returned. This time the mania is Rock 'n Roll. Every Rock 'n Roll session is a portrait of abandonment of one thousand years of civilization. These latter day victims, in the name of dancing, provide their individual and patterned version of rhythmic swirls, contortions, distortions, ecstacies, squeals, simpering, drooling, trances, all suggestive, contagious rhythm with minor sexual overtones — and all going back to the ancient time when men and women wore bearskin garments.

Nowadays there are skilled psychiatrists and psychologists who view these orgies with comprehension and apprehension. Their appraisal is not heartening. To them Rock 'n Roll and similar terpsichorean maladies have the clear cut marking of a revolution against frustration, inadequacy, maladjustment, reality and emptiness. While seeking to escape varied conformities, the victims are creating new and feckless conformities to which they are ardent adherents. The Rock 'n Roll sessions reflect inner pouting, self-pity and burials of failures to fit into situations calling for a maturity they do not possess and may never attain. Rock 'n Roll is a backward reach to the caresses and unconditioned love that mark infancy, even to the undisturbed comforts of uterine life. Rock 'n Roll is a feast of excited frustration unaccompanied by the joyful rapture that marks the hysterical mania of religious revivals that have got out of hand, moving into dancing shoutings.

In these fantasies the mind such as it is lies dead. Infancy takes over. Rock 'n Roll is the alcohol of the youngsters with some splashings over into physical but never mental adulthood. In a measure, Rock 'n Roll is the pantomine of a youth size temper tantrum revealing an inner rage against imagined deprivations even to the point of the loss of all shame. The Rock 'n Roll frenzy indeed is a masked ball. But the domino covers only the mind; the sweating body has no mask for its exhibitions. These dream state sessions are a sorry sight and these writhing anesthetized youngsters a pitiful lot.

Why this editorial. What has all this to do with the hard sense operation of industry and the administration of sound industrial medicine? The answer booms. At the present time some 20% of the industrial work force presents diagnosable abnormal mental states — not psychotics, just misfits, troublemakers, maladjusted, the leaners and the idlers. That is about the top number industry can stand. The next generation of industry's workers now cavorts in its teens in simpering rebellion against everything that is substantial.

It is insufficient to appeal to St. Vitus to heal this misbegotten lot over whom he presides. A saner appeal must be made to the psychiatrists. In far larger number they are beckoned into industry. To them is the shout "The rebels are coming — rebels armed with deadly frustration, maladjustment and prolonged infancy."

The dancing, hysterical ones of today are of the stripe and image of their dark age predecessors. But there is one difference. Of the early ones it was said, "They left all work." That cannot be said of these modern prancers. They have never done any work that they might stop.

Absent at Work

The opportunities for being absent at work while present on the job are legion and many are studiously contrived. Every office area is dimpled with the "daisy pickers," the up and down the hall patterers and prattlers, the restroom trotters, the drinking fountain addicts, the coffee break abusers. One office section manager repines "One of the fixed laws of this office is that nothing can be done in less than one-half hour." One secretary appears to be eagerly typing away. She is, but on the classroom notes of her husband law student; a willful absentee at work. One stockroom clerk gives every appearance of mighty strugglings with something important. Actually the pursuit is of such fantasies as, "I look better in a form fitting coat but they are not in style this year"; "A lot of people think Fred stole that bag of golf clubs but I know he didn't"; "If all four children get measles one after the other I am going to be out of here for weeks"; "Two more years of this and I am through with factory work forever." She is an absentee at work.

By no means is all absence at work due to work incompetence or to an inherent inability to apply attention. More often the attitude is such as these: "Nobody else around here works. Why should I?" "Right now I do twice as much work as any of the rest of the men. I am getting in wrong with everybody by showing them up." "Watch me foul this one up right. That'll put somebody in the hole. What can they do to me?" These absentees at work are not work faithful. These absentees belong to that ever present work component; the 20% of the mentally quirked. Truly, the trials of absentees at work equal those of the absentees from work.

Gleefully the foreman with the trumpet blaring over the birth of a mouse was shouting, "For seven weeks my department's absentee rate has not been over 2%." He is blind. His real absentee rate is 12%. Two percent for those off the job; 10% for those absent at work.

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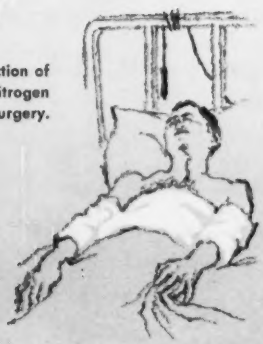

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Medical Director: M.D., Univ of Wisc; 6 yrs, med dir & consultant, lrge, nationally-known co; Also, Clinical Instructor, Indus Med, & Lecturer Occupational Hlth, univ med schl; seeks Med Dir, lrge institution, MW, NE, or East.

Medical Director: 2 yrs, private, general pract; 8 yrs, Med Dir, Nat'l co; intermittent courses, Int Med & Card, '52-'58; tired of travel assignment & desires regular hrs, Indus Med posi; prefs E. or Calif, will consider others.

Medical Director: 9 yrs, private pract; 3½ yrs, med ofc, US Army; 6½ yrs, Med Dir, lge, nationally-famous co; seeks position w/ advancement possibilities; any locality; middle 40's.

Medical Director: 7 yrs, Med Dir, heavy indus; 8 yrs, Med Dir, major co; highly qual'd all phases Indus & preventive Med; Member State Med Society's committee on Indus Hlth; will consider Asst Directshp, very lge co, semi-heavy, heavy or Chem indus w/good advancement potential; prefs East; references unite in outstanding commendations.

Assistant Medical Director: 36; MD, U of Ill, CM; sevl yrs, flight surg; 10 yrs priv genl pract plus indus clinical med & adm; sevl smaller plants; pref full-time indus post; immed avail; DNB.

Generalist: 28; strong interest career indus med; MD, Boston univ, S of M; 2 yrs, med ofc, USN; presently Sr med ofc, USN ord dept; mil serv completed; any locality; DNB; immed available.

Industrial Surgeon: 3 yrs, residency; 2 yrs, chief surg, USAF; 1½ yrs, phy & surg, US Army hsp; presently Med Dir, div of lrge corp; seeks assn w/clinic or surg limiting practice to Indus Surg; prefers So., SE, SW; Age 34.

Internist: Board Elig, med & cardio; trnd univ hsp; inter'd indus med as a career; seeks further exper in adm or clinical capacity; 2 yrs, indus exper as staff phy & district chief; grad Hahneman; early 30's; prefers Pa, NJ, NY, Del or eastern seaboard.

Staff Physician: Working toward Cert'n, Occupational Medicine; M.I.H., Harvard Schl of Publ Hlth; 18 mos, Int Med res wk; seeks Indus permanent position, full-time; East or Midwest.

Staff Physician: Graduate, Rush Medical; 13 yrs, very successful private, genl & surg pract; (AAGP); sevl yrs, flight surgeon, USAF; prefers indus medicine with regular hours; no locality preference; middle 40's.

Staff Physician: Interested in position, Industrial Medicine, which will eventually lead to Medical Directorship; 10 years, private, general practice including 7 yrs as med examiner, lge electric mfgr co; capable genl & ortho surg; any locality; early 40's.

Staff Physician: Two yrs, Med ofc, USAF; 1 yr, private practice; 2 yrs, Asst Phys, important foundation hsp; 1½ yrs, genl clinic practice; seeks indus med post in Florida, Ala or Georgia only; Age 37.

Foreign Appointment Desired: Woman Doctor with MPH degree seeks post as Consultant in Med Care, or Director of Prof Servs, or Assoc Prof, Med Care; special interest, geriatrics & chronic diseases; excl med educ & top-level exper; past 5 yrs, Asst Prof, Admin Med (tchg & rsrch); bd elig, Priv Med.

COMMENT AND OPINION

Workmen's Compensation

A perspiring worker who bathes in the company shower room after his shift ends, is serving his employer's best interests, says the Colorado Supreme Court. Therefore, the court rules, a worker who slipped and injured himself while showering is entitled to workmen's compensation. —*Industrial Relations News*, November 7, 1959.

Psychiatric Program

A mental health rehabilitation program, launched at Joseph E. Seagram & Sons, Inc., N. Y., guarantees psychiatric help to emotionally disturbed workers. The program, which covers 1,000 workers, has been in effect six months. Believing that mental illness contributes to poor work performance as much as physical ailments, Seagram pays a basic annual fee for the services of the Division of Organized Psychiatry at Mount Sinai Hospital, N. Y. Participation by employees is voluntary. The Seagram program, administered by Dr. Edward Schekman, the company's Medical Director, includes:

Consultation: The Seagram medical department and the hospital staff hold joint diagnostic consultations on patients referred by the plant physician. Consultation is covered by the annual fee, but treatment, including medication and hospitalization, is extra.

Retirement: Mental health aspects of retirement are studied with the aim of easing the "burden" of retirement. Specific emphasis is placed on ways the company can help retired workers keep in touch with former associates.

Testing: Psychological, vocational and personnel test results are compared with on-the-job performance of those tested to get an index of test prediction or measurement of job performance.

Cold Heart

New wonders in heart and brain surgery may result from studies of hibernation of ground squirrels by University of Wisconsin scientists, under the direction of Dr. Peter R. Morrison, Professor of Zoology and Physiology.

A useful medical technique, induced hypothermia, has already made possible unusual heart operations. Humans, however, have complications associated with low body temperatures that often result in death. Studies of hibernation may provide some clues on how to avoid these complications.

Hibernation is a method some animals have of conserving body reserves when conditions of temperature and food supply are unfavorable. The most striking characteristic of hibernation, as Dr. Morrison phrases it, is the "turning off of the physiological thermostat." With the thermostat off, body temperature drops with air temperature and may go as low as 40 degrees in some animals. Dr. Morrison's group is studying hibernation principally in the 13-lined ground squirrel that curtails its activity every year in order to escape the rigors of northern winters.

The Wisconsin researchers point out that the ability to hibernate is built into the ground squirrel's physiological makeup. Man does not have this built in mechanism and in fact is geared to an opposite response to lowered temperatures.

Dr. Karl L. Siebecker, a member of the anesthesia research group, reports that commonly used techniques in induced hypothermia allow the human body temperature to be safely lowered to about 85 degrees. At this temperature there is a five to eight minute safety period in which blood circulation may be interrupted. Longer periods without oxygen damage the brain cells and result eventually in death of the patient or a permanent deep coma. Dr. Siebecker points out that the principal limiting factor in reducing human body temperature is the effect on the coordination of heart action. At temperatures below 85 degrees the heart may develop uncoordinated contractions that, if not immediately corrected, terminate in heart failure. The hibernator has some way of avoiding this.

The animal in hibernation has a metabolic rate some 2% of normal which permits the animal to go without food for most of the winter. Reduced metabolic rate also means that body organs can survive longer periods of oxygen deprivation during blood supply stoppage than is possible normally.

Applied to humans, hypothermia at lower temperatures than are now possible would mean a greater safety factor in operations in which the circulation of blood may have to be stopped.

Preventive Medicine Film

The Council on Industrial Health has recently reviewed a new film produced by the United States Air Force. The film, according to the Council's review, presents the philosophy that industrial medicine should be primarily concerned with prevention and shows clearly the "team" approach necessary to industrial health.

"Air Force Industrial Medicine in Action" is produced in color and has a showing time of 20 minutes. It illustrates the investigation and solution of an occupational health problem in an Air Force manufacturing establishment, to which attention was attracted by an unusually high rate of absenteeism in one of the operations.

"Air Force Industrial Medicine in Action" is available, at no charge, from the Armed Forces Film Library Center, St. Louis 23, Missouri.

Where There's Smoke

The New Jersey Volunteer Firemen's association, made up of 215 volunteer fire companies, approved the rough draft of a proposed legislative bill stating that an active member of a municipally controlled volunteer fire company who becomes disabled or partly disabled from tuberculosis or other diseases of the respiratory system will be considered the victim of an occupational disease if the diseases becomes manifest within a specific time after the event presumed to have caused the attack.

The proposed legislation will be discussed by the joint legislative committee to the various firemen's associations of the state.

There's Fire

Arsonists and fire-fighters may be cut from the same psychological cloth, according to a psychiatrist at the University of Michigan Medical Center.

Jose J. Llinas, M.D., said, "Men who later show interest in fire-fighting as a profession seem to have had unusually strong problems in controlling their aggressive impulses at an early age. Remnants of certain primitive impulses are seen in disguised form in many of the fireman's professional activities." He included such traits as aggressiveness, muscular ability and accent on speed, teamwork and brotherhood.

He cited earlier studies of arsonists which, he said, had shown somewhat similar psychological conflicts.

Dr. Llinas said the fireman's emphasis on strength "could conceal inner feelings of help-

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lessness; his quick efficiency attempts to deny a slow, more deliberate nature; and his stress on teamwork may camouflage deep feelings of rivalry and competition." As an idividual reaches adolescence, he tends to "overcontrol" certain infantile impulses which create personality conflicts within himself.

The fireman has found a healthy, socially approved outlet for this conflict, while the arsonist reacts in a manner which puts him in conflict with the law.

Overseas Travel

In most industrial organizations numerous members of the organization engage in overseas travel for pleasure or business every year. Invariably there are immunization requirements. It is the medical department that is consulted for guidance. *Immunizations Information for International Travel* has just been issued. A copy should be in the files of every industrial medical department. Copies (at 30 cents each) may be obtained by writing the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Pollution Survey

A statewide survey to determine air pollution problems in Minnesota has been launched by the Minnesota Department of Health.

George J. Rashka, Associate Chief of the Section of Radiation and Occupational Health of the Health Department and director of the survey, said his department is in the process of sending out questionnaires on air pollution to all local governments. The questionnaire is a general one designed to obtain a rough self-appraisal of what air pollution problems, if any, a community may have.

Raschka said the survey would be followed up by personal visits by members of his staff to every county of the state, particularly communities with problems.

A second phase of the survey will be the mailing out of questionnaires to county agricultural agents to determine if there are any air pollution problems confronting agriculture.

"In a number of other states," Raschka said, "the effect of air pollution on agriculture has been serious. We are not aware that we have any problems at the present time but feel that through the survey some problems that may exist may be called to our attention."

Raschka said the U. S. Public Health Service is providing his department with guidance for the survey.

—*St. Paul* (Minn.) *Pioneer Press* Nov. 24, 1959.

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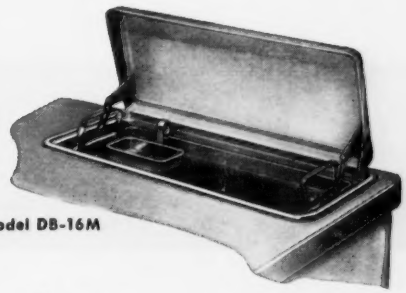

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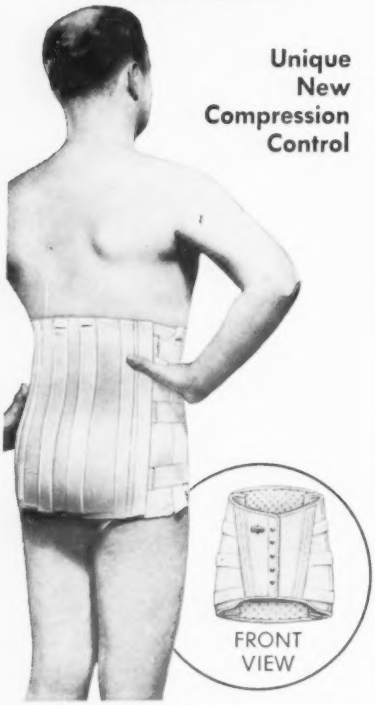

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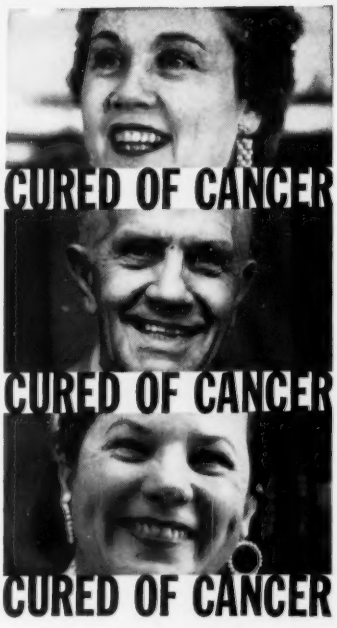

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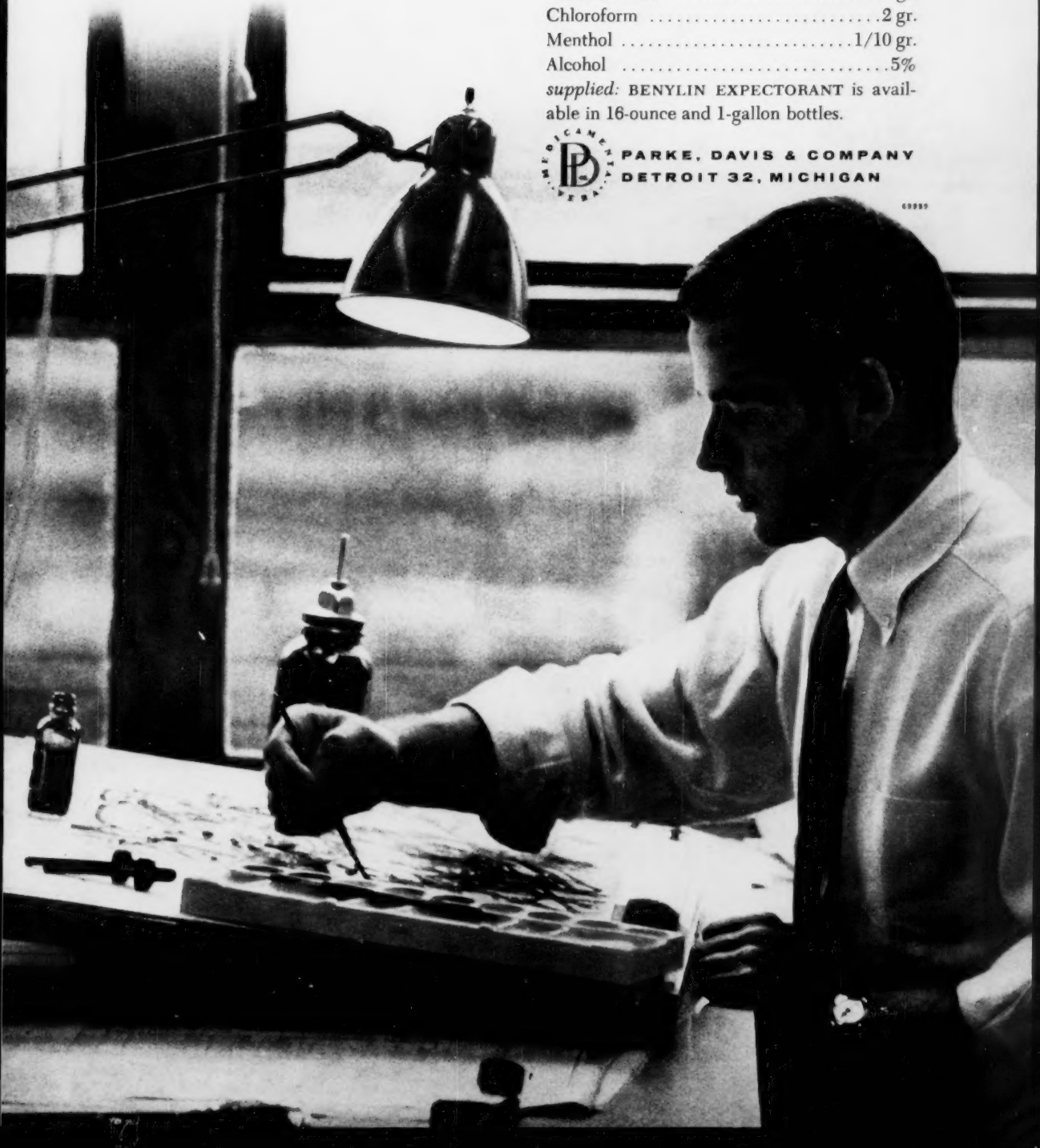

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1. Kelly, J. J., Jr.: Am. J. Med. Sci. *232*:119-128 (Aug.) 1956.

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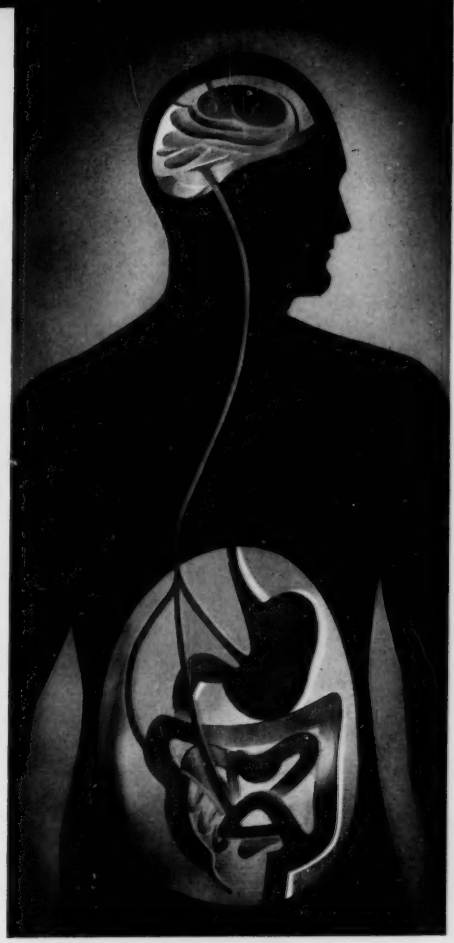

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REFERENCES:

1. Langs, R. J. and Strauss, M. B.: J. Allergy. 30: 130-139 (March-April), 1959.
2. Langs, R. J., Fuchs, A. M., and Strauss, M. B.: Indus. Med., 28: 6, 257-261 (June); 1959.
3. Kligman, A. M.: J.A.M.A., 171: 592, (Oct. 3) 1959.
4. Personal Communications.

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1. Gordon, E. E. and Haas, A.: Industrial Medicine & Surgery 28:217, 1959.

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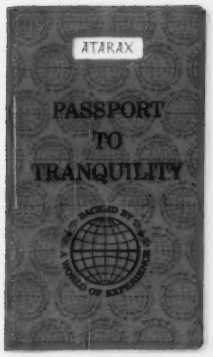

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IN PREMENSTRUAL TENSION	"The consensus appears to be that this agent has a definite calming effect on nervous and agitated subjects with symptoms such as . . . premenstrual tension. . . ." Shalowitz, M.: Geriatrics **11**:312 (July) 1956.	Schuller, E.: Gaz. des Hôpitaux **129**:391 (Apr. 10) 1957. Dolan, C. M.: California Med. **88**:443 (June) 1958.
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Krantz, J. C., Jr.: The restless patient – A psychologic and pharmacologic viewpoint. Current M. Digest 25:68, Feb. 1958.

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